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WILSON (E. E.). **Sodium pentachlorophenate and other materials as eradicative fungicides against Sclerotinia laxa.**—*Phytopathology*, 40, 6, pp. 567–583, 3 graphs, 1950.

At the College of Agriculture, Davis, California, a spray preparation consisting of sodium pentachlorophenate at a dosage of 4 lb. per 100 gals. plus a small quantity of wetting agent, applied to dormant almond trees in January over a period of years from 1944 onwards, reduced by 37 to 87 per cent. the number of sporodochia formed by *Sclerotinia laxa* on twigs and adhering blossom parts blighted in the previous spring [*R.A.M.*, 22, p. 440]. The results of this eradicative treatment compared favourably with those of one protective application of Bordeaux mixture (10–10–100) at the stage after the unopened blossoms had emerged from the bud scales, but neither method alone gave satisfactory control of the disease under all conditions. The former reduced the incidence of blossoming twig blight by 31 to 73 per cent. in different years and the latter by 48 to 64 per cent. A combination of both treatments in 1948 effected a reduction of 76 to 95 per cent. and in 1949 of 76 per cent., whereas two treatments with Bordeaux, the second being applied when half the blossoms were open, lowered it by 82 per cent. Sodium pentachlorophenate destroyed the conidia present on application and repressed further development. Destruction of conidia reached a maximum when the treated twigs were continuously moist and fell to a minimum when they were continuously dry. Artificial weathering of treated twigs with a water spray diminished the repressive action of the chemical on the sporodochia. Similarly, in the field conidial destruction was negligible during dry weather, and heavy rains counteracted the repressive effect of the treatment. Hence it would appear that the year-to-year variability in efficiency of the sodium pentachlorophenate treatment was caused by rainfall on the spray film. The compound becomes increasingly toxic to the sporodochia with a rise of temperature from 5° to 30° C. and a significant improvement accompanied the admixture of a 0·003 per cent. sodium lauryl sulphate or 0·5 per cent. emulsifiable petroleum oil (Shell medium soluble) supplement.

WEBB (P. C. R.). **Bacterial infection of fruiting spurs of sweet Cherry (Pseudomonas mors-prunorum Wormald and Ps. prunicola Wormald).**—*Rep. E. Malling Res. Sta., 1949*, pp. 120–121, 1 pl., 1950.

In the spring of 1946 observations suggested that nearly all the cankers in young cherry trees arose from spur infections. In November, 1948, extremely early stages of spur infection by *Pseudomonas mors-prunorum* and *P. prunicola* [*R.A.M.*, 30, p. 14] were observed at East Malling, Kent. The position of the infection suggested that entry had taken place in the deep crevices in the spur bark. These folds frequently contain fungi, including species of *Sclerotinia*, which apparently cause only slight damage and are not antagonistic to the bacteria in culture.

In the spring of 1947 samplings of the bacterial population on the surface of the

trees sprayed with Bordeaux mixture three weeks previously yielded 114 cultures from spurs with retarded buds, 9 from healthy spurs, 11 from smooth one-year-old wood, 4 from smooth two-year-old wood, and 27 from the crotch. When longitudinal sections of infected spurs were mounted in water, the bacteria were violently extruded with gum-like granules. Extrusion of gum did not take place without the bacteria, i.e., from spur crevices containing only fungi. Under conditions of prolonged rain it is very probable that bacteria may emerge from infected spurs, providing a possible source of inoculum for leaf spot.

BLUMER (S.). **Viruskrankheiten an Kirschbäumen im Gebiete des Zürichsees.** [Virus diseases of Cherry trees in the Lake Zürich district.]—*Schweiz. Z. Obst- u. Weinb.*, 59, 16, pp. 286–291, 3 figs., 1 map, 1950.

Symptoms of virus infection have been detected on a total of 19 cherry trees of various ages in 11 commercial orchards surrounding Lake Zürich, excluding one heavily contaminated planting previously observed. Determination of the affected varieties presented considerable difficulty, but they were found to include Hedelfinger, Langstieler, Sauerhäner, Knellkirsche, and Webers Sämling. With the exception of one young tree, all appeared to be suffering from the same disease, manifested by belated renewal of growth and poor development. The first symptoms consist of occasional malformations, oil spots, or slight mosaic on normal-sized leaves, while most conspicuous in the later stages are the small, dry, hard, sharply dentate leaves, on the lower surfaces of which, especially along the midrib, dark green excrescences (enations) may not infrequently be seen. The lateral veins are usually deflected near the midrib and run parallel with it for a short distance, so that it seems to be broken up into strands: this feature, however, appears to be conditioned or at any rate accentuated by frost. The extrafloral nectaries on the petioles are dark brown or black and severely reduced. The fruit stalks remain short, and ripening is delayed by at least a week.

All these symptoms are more or less characteristic of the 'Pfeffinger' disease [*R.A.M.*, 30, p. 48], but there are various differences between the two viroses. For instance, leaves attacked by the Zürich virus are small but not narrow and do not taper into points. In the 'Pfeffinger' disease enations are rarer than in the Zürich virus, while the apical rosette formations characteristic of the former are absent in the latter. The most striking contrast between the two maladies, however, is the rapid, acute course of the 'Pfeffinger' disease, totally destroying a tree in six to eight years, and the insidious, chronic process characteristic of the Zürich virus, which had already been observed 10 to 12 years earlier on one of the properties inspected. After showing symptoms for five years, another heavily infected tree produced a heavy crop. The slow progress of the Zürich virus within the tree is paralleled by its generally slight tendency to spread, whereas the 'Pfeffinger' disease radiates in all directions.

In the autumn of 1948 scions of the Bing variety were grafted on EM 3/1 stocks previously inoculated [? with the Zürich virus] at the Wädenswil Experiment Station, and in the following year slight foliar mottling and distortion developed, followed by the typical 'Pfeffinger' tapering. At the same time prominent excrescences, a feature of the Zürich virus, were formed on the lower surfaces of the leaves. In the autumn of 1949 a similar test was performed, using as stocks Sauerhäner infected by the Zürich virus. Again the Bing scions developed typical 'Pfeffinger' symptoms of approximately the same severity as in the previous test. There are thus no grounds at present for regarding the Zürich virus as an attenuated strain of 'Pfeffinger.'

Various characteristics of the Zürich virus are reminiscent of the American rasp leaf [ibid., 27, p. 355]. Both are comparatively harmless, but since the line of demarcation between the Zürich and 'Pfeffinger' disease is not yet clearly recog-

nized, precautions against dissemination are indicated. Specially to be avoided is the use of scions from diseased trees.

Cherry viruses are probably more widespread in Switzerland than hitherto supposed. In Ticino, for instance, a disease resembling crinkle [ibid., 25, p. 304] has been observed, besides a condition strongly suggestive of 'Pfeffinger'. There are also a number of suspected cases of virus infection in the orchards of the Rigi.

Ruehle (G. D.) & Wolfenbarger (D. O.). **Diseases and pests of the Mango in Florida.**—*Mimeogr. Rep. Fla subtrop. Exp. Sta.* 13, 6 pp., 1949.

The commonest and most widespread fungus disease of mangoes in Florida is anthracnose (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*: *R.A.M.*, 17, p. 761; 18, p. 750; 26, p. 536; 28, p. 8; 29, p. 89]. Most of the infection takes place from the start of the blossoming period until the fruits are more than half grown. Bordeaux mixture is the most reliable fungicide so far tested [ibid., 16, p. 823], and the 6–6–100 formula is recommended. Wettable cuprocide 1·5 lb. per 100 gals., tribasic copper sulphate (53 per cent. metallic copper) at 3 lb. per 100 gals., copper A compound at 4 lb. per 100 gals., and other fixed copper fungicides give almost equally good control. A wetter or spreader-adhesive should be added. The following spray schedule is recommended at present: first bloom spray before individual flowers open; second bloom spray seven days later (followed by others if necessary, at intervals of seven days); a third spray about four weeks after the first, if additional bloom sprays were not given; a fourth, three to four weeks after the third; and a final application one month later.

Scab (*Elsinoe mangiferae*) [ibid., 26, p. 552] is of minor importance in commercial groves in Florida, but is serious in nurseries. The spray schedule against anthracnose will also control scab, though more frequent application is necessary in nurseries. Powdery mildew (*Oidium* sp.) [cf. ibid., 25, p. 292] is a very minor trouble, but should be readily controlled, if necessary, by weak copper fungicides or sulphur sprays or dusts. Red rust (*Cephaleuros virescens*) is also a minor disease; usually one copper spray applied during the dry spring months will control this trouble. Stem-end rot often causes spoilage in transit and storage; in Florida it is generally associated with *Diplodia natalensis* [cf. ibid., 14, p. 286; 24, p. 189], though *Diaporthe citri* [cf. ibid., 18, p. 193] may be present. Direct methods of control require investigation. Mango trees suffering from zinc deficiency have small, recurved, thick, stiff leaves sometimes accompanied by pronounced chlorosis. When the condition is long-standing and severe, twig die-back and abnormalities of the bloom panicle may occur. The condition is corrected by spraying with zinc sulphate (5 lb.) plus hydrated lime (2·5 lb.) in 100 gals. water. The zinc salt may be added to Bordeaux mixture for one of the anthracnose sprays. Copper deficiency symptoms often occur in young trees forced into growth by nitrogenous fertilization and may accompany zinc deficiency symptoms. The appearance of weak terminal shoots followed by defoliation and die-back, on the ends of long drooping or S-shaped branches of the preceding cycle of growth is usually evidence that copper is required. The remedy is to spray the foliage with a copper fungicide, but prevention by periodic application of nutritional sprays containing copper and zinc is easier.

Hadiwidjaja (T.). **Over meeldauw bij Rambutan.** [On mildew of Rambutan.] —*Landbouw*, 22, 5–6, pp. 245–261, 3 figs., 1950. [Javanese and English summaries.]

In October, 1949, a severe outbreak of powdery mildew, attributed to *Oidium nephelii* n.sp. [without a Latin diagnosis], was observed on the inflorescences, fruits, and leaves of rambutan (*Nephelium lappaceum*) at Bogor (Buitenzorg) and Djakarta (Batavia), Java [cf. *R.A.M.*, 18, p. 504]. A whitish to greyish efflorescence develops and later the diseased areas turngrey to brownish black. Diseased

flowers, fruits, and young leaves may drop. Fruits attacked at a relatively late stage of growth may adhere to the clusters until detached by heavy showers and strong winds, which may bring down several hundred, 10 to 15 mm. in diameter, at a time. Differences in varietal reaction to the disease have been observed, among the most susceptible types being Silengking and Lebakbulus, while the more resistant include Simatjan, Sitangkoë, and Atjeh.

O. nephelii parasitizes the epidermal cells of the fruit walls, shoots, and young leaves. The long, erect conidiophores arising from the epidermal cells bear at their apices one or very rarely more conidia, those from the fruits measuring 19·5 to 48·8 by 9·8 to 26 (34·6 by 16·4) μ and those from the leaves 19·5 to 48·8 by 9·8 to 22·8 (33 by 16·1) μ. The perfect state has not been observed.

O'Kane (W. C.). **Fungicidal composition—U.S. Patent 2,460,188, Application May 2nd, 1945; Issued January 25th, 1949.**—Abs. in *Biol. Abstr.*, 24, 4, p. 1049, 1950.

In tests with copper, zinc, manganese, mercury, and lead salts of kojic acid [*R.A.M.*, 27, p. 488], all except the zinc salt were superior to Bordeaux mixture in controlling early blight of tomatoes (*Alternaria solani*) and snapdragon [*Antirrhinum*] rust [*Puccinia antirrhini*], but only the copper salt gave superior control of late blight (*Phytophthora* [*infestans*]). In tests with spores of *Sclerotinia fructicola*, *A. solani*, and *Venturia inaequalis* only the cadmium salt was comparable in activity with Bordeaux mixture.

Nation-wide results with fungicides in 1949. Fifth annual report.—*Plant Dis. Reptr, Suppl.* 192, pp. 120–187, 1950. [Multilithed.]

This report of the Fungicide Committee of the American Phytopathological Society (Sub-Committee on Testing and Results of Newer Fungicides) [cf. *R.A.M.*, 28, p. 471] contains a list of co-operators who carried out experiments in 1949, the localities concerned, the chemicals tested and their sources, and the results.

In general, ceresan M continues to be the most widely used commerical treatment for cereals, and is used rather extensively on some other crops. Arasan, phygon, and spergon continue as the principal materials for treating maize. Vegetable seed treatment commercially was very similar to the previous year. In Canada anticarie SD (48 per cent. hexachlorobenzene) is used for the control of wheat bunt [*Tilletia caries*: ibid., 28, pp. 443, 562], ceresan M and leytosan ($\frac{1}{2}$ oz.) are the principal mercurials for wheat grain used chiefly as dusts. For fruits arathane (dinitrocapryl crotonate) was effective in controlling apple and peach powdery mildew [*Podosphaera leucotricha* and *Sphaerotheca pannosa*], crag 341 C (mixed glyoxalidines) and puratized agricultural spray were very good against brown rot spur blight of cherries [*Sclerotinia fructicola*], crag 658 (copper zinc chromates) was good against almond brown rot [*S. laxa*: ibid., 23, p. 492]; the dithiocarbamates against apple fruit spot [*Pleospora herbarum*], flyspeck [*Leptothyrium pomi*], bitter rot [*Glomerella cingulata*], rust [*Gymnosporangium juniperi-virginianae*], and black spot [scab: *Venturia inaequalis*] on the leaves, tag HL 331 (phenyl mercury acetate) for scab, and SR 406 (N-trichloromethyl thio-tetrahydrophthalimide) for fruit spot; zerlate and fermate both gave very good control of raspberry anthracnose [*Elsinoe veneta*]. For vegetables, potatoes, and tomatoes zineb (zinc ethylene bisdithiocarbamate) gave excellent performances against a number of common diseases, and both magnesium and manganese ethylene bisdithiocarbamates were very effective against potato and tomato early blight [*Alternaria solani*] and tomato anthracnose [*Colletotrichum phomoides*]. The manganese salt also gave very promising control of rose black spot [*Diplocarpon rosae*]. Other materials promising for ornamentals were the carbamates against azalea [*Rhododendron*] petal blight [*Ovulinia azaleae*:

ibid., 29, p. 415], carnation rust [*Uromyces dianthi*], antirrhinum rust [*Puccinia antirrhini*: see preceding abstract], and *Septoria* leaf spot [*S. chrysanthemella*] of chrysanthemum.

Robinson (R. G.) & Dunham (R. S.). **A sprayer for experimental plots.**—*Agron. J.*, 42, 1, pp. 57–58, 1 fig., 1950.

The compressed-air, reduction-valve apparatus has very satisfactorily met the requirements of the Minnesota Agricultural Experiment Station for an accurate low-volume sprayer for small individual plots [cf. *R.A.M.*, 27, p. 433]. The oxygen tank is filled to 120 lb. pressure with compressed air through a tyre valve stem placed in one end. A globe valve releases the air to the reduction valve, which can be locked in place at any desired pressure as read on the gauge. The spray solution is placed in a metal can of 6 oz. to 1 qt. capacity held by the operator, its screw-on cap being fitted with inlet and outlet tubes. A different spray rod, screw top, and set of cans is maintained for each chemical, so that no contamination problem arises. On a large series of plots two operators should be employed, one to spray and the other to add the chemical to the can. The entire outfit weighs 23 lb. and the materials for its construction cost $20.53.

Boerger (A.). **Immunitätsgenetik und Resistenzzüchtung landwirtschaftlicher Kulturpflanzen im La Plata-Gebiet.** [Immunity genetics and the breeding of agricultural plants for resistance in the La Plata region.]—*Z. PflZücht.*, 29, 1, pp. 6–34, 1950.

Many of the papers listed in the six-page bibliography appended to the author's comprehensive survey of research and experimental work on plant breeding for resistance to diseases and pests in Argentina, Rio Grande do Sul, and Uruguay have been noticed from time to time in this *Review*.

Rudorf (W.). **Beobachtungen auf dem Gebiete der Pflanzenzüchtung in U.S.A. Oktober—November 1948.** [Observations in the sphere of plant breeding in U.S.A. October to November, 1948.]—*Z. PflZücht.*, 28, 3, pp. 273–354, 9 figs., 3 graphs, 8 maps, 1950.

This fully tabulated and documented report on the author's visit to the United States during October and November, 1948, is based not only on personal observations and conversations with scientists, but also on a perusal of the relevant literature [cf. *R.A.M.*, 27, p. 15 *et passim*]. Particular interest naturally attaches to crops which are of comparable importance in German agriculture. The crops included in the survey are wheat, oats, barley, potato, soy-bean, sugar beet, bean [*Phaseolus vulgaris*], pea, onion, tomato, and white cabbage. In each case resistance to various common diseases and the performance of recommended varieties in this respect are given particular attention. The literature relating to each crop is assembled in a four-page bibliography at the end of the paper.

Braun (H.) & Riehm (E.). **Krankheiten und Schädlinge der landwirtschaftlichen und gärtnerischen Kulturpflanzen und ihre Bekämpfung. Sechste Auflage.** [Diseases and pests of cultivated agricultural and horticultural plants and their control. Sixth edition.]—vii+345 pp., 242 figs., 1 diag., Berlin, Paul Parey, 1950. DM. 22 half-cloth, DM. 20 in boards.

The first (general) part of this valuable, fully documented treatise deals briefly with the concept, symptomatology, and etiology of diseases, vegetable (mainly fungal) and animal agents of disease; preliminary conditions for disease; origin and course of diseases; plant protection measures; economic importance of plant diseases; and organization of plant protection.

The second (special) part comprises sections on the diseases and pests of cereals,

potatoes (the two most comprehensively treated, covering 73 and 39 pages, respectively), beets, carrots, clover, lupins, soy-beans, lucerne, serradella [*Ornithopus sativus*], beans (*Phaseolus*) [*vulgaris*] and peas, cabbage, tomatoes, onions, asparagus, cucumbers, rape, flax, opium poppy, tobacco, hops, fruit, and vines, and injurious agencies and pests common to many plants. Each section is preceded by keys for the identification of the diseases and concludes with directions for control.

An alphabetical index of the subject matter is appended.

Advances in agronomy. Volume I.—xii+439 pp., 3 figs., 7 diags., 5 graphs, 2 maps, New York, Academic Press, Inc., 1949. $7.50.

The objective of this treatise, edited by A. G. Norman, is the survey and review of recent developments in the field of agronomic science, a coherent treatment of new material being presented against the background of established and accepted information. Each of the ten contributions is followed by a bibliography of the relevant literature. Matter of phytopathological interest occurs, e.g., in the section on soy-beans by M. G. Weiss (diseases, pp. 143–148); alfalfa [lucerne] improvement by W. J. White (pp. 232–237); soil micro-organisms and plant roots by F. E. Clark (pp. 242–282); boron in soils and crops by K. C. Berger (pp. 321–348); and potato production by O. Smith (pp. 353–385).

Stout (G. L.). **New methods of plant disease control.**—*Bull. Dep. Agric. Calif.*, 39, 3, pp. 129–136, 1950.

After a historical survey of plant diseases and their control, the author reviews the recent progress made in the fields of chemotherapy, antibiotics, healthy seed and stock, and protection from viruses by prior inoculation, most of which has already been noticed from the original sources. A bibliography of 19 titles is appended.

Field crop variety recommendations for Oregon.—*Sta. Bull. Ore. agric. Exp. Sta.* 476, 24 pp., 1 map, 1950.

The crop varieties recommended for six different zones in Oregon have been tested throughout the State. Brief descriptions and local performance of the varieties of cereals, flax, forage, and seed crops recommended are given together with those not recommended. Among the wheat varieties [*R.A.M.*, 30, p. 25] Orfed, an autumn or spring variety, is resistant to smut [bunt: *Tilletia caries*] but when sown in autumn is susceptible to dwarf smut [bunt: *T. caries*: ibid., 28, p. 443; 30, p. 30]. White Federation 38 [ibid., 29, p. 150] is resistant to bunt and some races of rust [*P. graminis*] and Hard Federation 31 spring wheat is susceptible to bunt but resistant to shattering and lodging. Schoolman, a white spring oat, is highly resistant to smut [*Ustilago* spp.]. Cascade, a late maturing flax, is resistant to wilt [*Fusarium lini*] and rust [*Melampsora lini*]. Two lucerne varieties resistant to wilt [*Ascochyta imperfecta*: ibid., 29, p. 213] are Ranger and Oreston. Willamette sweet clover is resistant to stem rot [*Sclerotinia trifoliorum*].

Silveira (V. D.). **Elementos de fitopatologia.** [Elements of phytopathology.]—*Rev. Agron., Rio de J.*, 8, 1, pp. 1–86; 2, pp. 189–247; 3, pp. 281–327, 68 figs., 5 diags., 1949.

This useful compendium of the rudiments of phytopathology comprises an introductory chapter followed by eight others dealing, respectively, with symptomatology, etiology, control (by exclusion, eradication, protection, and immunization), bacteria, bacterial diseases, Myxomycetes, the Phycomycetes, and the principal diseases caused by Phycomycetes in Brazil.

Silveira (V. D.). **O exame fitopatológico dos sementos.** [The phytopathological examination of seeds.]—*Bol. Soc. brasil. Agron.*, 10, 3, pp. 143–160, 7 figs., 2 diags., 1947. [Received November, 1950.]

Following a full description from the published literature of various standard methods for the phytopathological examination of seeds, the author lists a number of fungi isolated from seeds (mostly vegetable) at the National School of Agronomy, Rio de Janeiro, including *Sclerotium rolfsii* from lettuce [*R.A.M.*, 11, p. 349], *Phomopsis vexans* from eggplant [ibid., 26, p. 146; 28, p. 326], and *Ascochyta abelmoschi* from *Hibiscus esculentus* [ibid., 27, p. 197].

Centraalbureau voor Schimmelcultures, Baarn (Holland). List of cultures 1950.—144 pp., 1950.

This is a revised list of fungi maintained at the Centraalbureau voor Schimmelcultures, Baarn [cf. *R.A.M.*, 29, p. 109] which numbered 7,630 cultures at the end of 1949.

Perkins (D. D.) & Ryan (F. J.). **La mutación en los micro-organismos.** [Mutation in micro-organisms.]—*Cienc. e Invest.*, 6, 9, pp. 387–396, 1950.

This is a survey, based on 76 contributions to scientific periodicals, of the information assembled to date on mutation in micro-organisms [cf. *R.A.M.*, 28, p. 229], which is presented under the headings of functional definition; type of phenotypical differences; origin of mutational differences; the use of micro-organisms for studies on heredity; the genetic control of biosynthesis in micro-organisms; mutational differences in micro-organisms and their influence on concepts of the nature of the gene; formal genetic studies on micro-organisms; recombination in viruses and bacteria; and the employment of heterokaryons. The article concludes with a study of populations and adaptation.

Petch (T.) & Bisby (G. R.). **The fungi of Ceylon.**—Peradeniya Manual 6, vi+111 pp., 1 map, Govt. Publications Bureau, Colombo, 1950. Rs.3, or 4 shillings.

This manual brings together all the records of fungi found in Ceylon. Berkeley and Broome and others by 1874 had recorded some 1,200 species, mostly described as new and Petch from 1905 to 1948 revised and added to these in a long series of papers. In this work a total of 2,214 species is accepted for the island. Lists of synonyms and references are appended, as well as host indexes. The introductory pages include summaries of the physiography and climate, history of mycology in Ceylon, and analyses of the fungus flora, including entomogenous and introduced fungi.

Bernaux (P.). **Extension au Midi méditerranéen de trois maladies cryptogamiques.** [Extension to the Mediterranean South of three fungal diseases.]—*Progr. agric. vitic.*, 134, 40–41, pp. 208–214, 1950.

Notes are given on the symptoms, causes, and control of three plant diseases which have recently appeared in the Mediterranean area of the south of France. Cherry anthracnose (*Coccomyces hiemalis*) [*R.A.M.*, 29, p. 11] was present in a nursery in Gard in 1950, in the conidial state. Maratelli rice at Crau was affected by *Piricularia oryzae* [ibid., 27, p. 335; 28, p. 486]. Stocks (*Matthiola annua*) at Vence (Alpes-Maritimes) were attacked by *Oidium matthiolae* [ibid., 20, p. 495.]

Mallamaire (A.). **Les principaux insectes nuisibles et les maladies cryptogamiques des oléagineux alimentaires en Afrique noire.** [The principal harmful insects and the fungal diseases of oleaginous food plants in native Africa.]—*Agron. trop.*, 5, 7–8, pp. 384–396, 20 figs., 1950.

Brief notes, based largely on the relevant literature and arranged under the

common names of the hosts, are given on the chief fungal diseases of groundnut, oil palm, coco-nut palm, *Butyrospermum parkii*, sesame, and watermelon in native Africa. Rosette is the only groundnut disease of economic importance. Oil palms are affected by *Bacillus* [*Bacterium*] *coli* [cf. *R.A.M.*, 12, p. 426; 26, p. 287], the trees developing an internal yellowing and fruit ripening being arrested; the condition is common in acid soils deficient in phosphates.

Oil palms are also affected by *Meliola elaeis*, *Meliolinella palmicola* [cf. ibid., 8, p. 405; 29, p. 56], and *Parodiella gloeosporidia* [ibid., 28, p. 31]; the mycelia of all three form blackish plaques resembling those caused by sooty moulds. *Cercospora palmicola* var. *stilbacea* forms yellowish, later blackish spots on oil palm leaves and may cause some damage. In the coastal region of Kribi, Cameroons, coco-nut palms are affected by a fetid heart rot associated with bacteria, various saprophytes, and *Fusarium semitectum* var. *majus*, *F. conglutinans*, and *F. dimerum* [ibid., 30, p. 35]. *Butyrospermum parkii* (shea butter), which grows over a large part of French Sudan, is affected by *Pestalotia heterospora* and *Fusicladium butyrospermi*, the former causing greyish, dry, irregular leaf spots and the latter yellow ones with a dark brown border.

HOUTMAN (G.). **Over een schadelijkezwam : Sclerotinia sclerotiorum.** [On a pathogenic fungus: *Sclerotinia sclerotiorum*.]—*Cult. en Handel*, 16, 6, pp. 370–372, 5 figs., 1950.

Popular notes are given on the mode of infection and symptomatology of *Sclerotinia sclerotiorum* on bean [*Phaseolus vulgaris*: *R.A.M.*, 26, p. 277], chicory, tomato [ibid., 12, p. 780], and tulips in Holland, where other hosts of the fungus include cucumber and pansy.

SILVEIRA (V. D.). **Flora microbiana do ar atmosférico.** [Microbial flora of the atmospheric air.]—*Bol. Soc. brasil. Agron.*, 9, 1, pp. 9–33, 10 pl., 6 figs., 6 diags., 1946. [Received November, 1950.]

The following methods of analysis of the atmospheric microflora are described and discussed: gravity, air-washing, and aeroscopic collectors. In the author's studies in the city of Rio de Janeiro, spores trapped on slides were transferred to culture tubes by Keitt's technique (*Phytopathology*, 5, pp. 266–269, 1915). Among the fungi isolated by this means were species of *Rhizopus*, *Mucor*, *Syncephalastrum*, *Oospora*, *Monilia*, *Cephalosporium*, *Trichoderma*, *Botrytis*, *Penicillium*, *Aspergillus*, *Trichothecium*, *Cladosporium*, *Helminthosporium*, *Acrothecium*, *Alternaria*, *Stemphylium*, and *Fusarium*, besides a number of yeasts [cf. *R.A.M.*, 29, p. 40].

PADY (S. M.), PETURSON (B.), & GREEN (G. J.). **Arctic aerobiology. III. The presence of spores of cereal pathogens on slides exposed from airplanes in 1947.** —*Phytopathology*, 40, 7, pp. 632–641, 1 map, 1950.

In the course of four flights during August and September, 1947, in the Arctic and subarctic regions [*R.A.M.*, 28, p. 133], 52 vaseline-coated slides were exposed for five minutes at altitudes of 4,000 to 5,000 ft. Among the spores trapped were those of *Puccinia graminis*, *P. triticina*, *Helminthosporium sativum*, *H.* sp., and smuts (*Ustilago* and *Tilletia* spp.). In two flights beyond the Arctic Circle, and in the third, beyond the tree line, the spore numbers were low and probably not significant. The fourth flight, from Yellowknife, Northwest Territories, to Edmonton, Alberta, yielded significant numbers of spores of all the above-mentioned species. The prevalence of the associated cereal diseases in Western Canada and the adjacent areas of the central United States is reviewed.

Hamner (C. L.), Sell (H. M.), Klomparens (W.), & Vaughn (J. R.). **Selective inhibition of the growth of green plants and fungi by beta methyl umbelliferone.** —*Bot. Gaz.* 112, 1, pp. 135–137, 2 figs., 1950.

In replicated experiments made at the Michigan State College, the growth in culture of *Poria monticola*, *Fusarium* [*bulbigenum* var.] *lycopersici*, and *Monilinia* [*Sclerotinia*] *fructicola* was reduced by about one-half by the addition to the medium of 20,000 p.p.m. [2 per cent.] beta methyl umbelliferone, which occurs naturally in the bark of *Daphne mezereum* and in the resins galbanum and asafetida.

Raper (J. R.). **Sexual hormones in Achlya. VII. The hormonal mechanism in homothallic species.**—*Bot. Gaz.*, 112, 1, pp. 1–24, 6 figs., 1 diag., 4 graphs, 1950.

During the course of this investigation made at the Hull Botanical Laboratory, Chicago, a most useful technique was perfected for mating fungi on opposite sides of a permeable membrane, for a demonstration of hormonal activities in aquatic fungi. A layer of agar medium 1 mm. or less in depth is solidified in a Petri dish. Into a small hole at one side of this is inserted inoculum of one partner, consisting of a small cube cut from the periphery of a vigorously growing agar culture. A disk of sterile dialyzing 'cellphane' membrane cut to extend to the edge of the dish, is laid on the surface of the agar and any air bubbles pressed out. The membranes may be handled easily if they are stacked alternately with circles of filter paper, wetted thoroughly, drained of excess water, and autoclaved. Both the filter paper and the adjacent membrane are transferred to the plate; the filter is then removed. Additional agar, cooled to about 40° C. is poured over the membrane to a depth of about 1 mm. and, after solidifying, is inoculated on its surface at the side opposite to the first inoculum. The two mycelia overlap in three to four days. Since the plate must be opened at least seven times by this method, strict care is necessary to prevent contamination.

Malan (C. E.). **Apparecchiatura elettrica sostituente il becco Bunsen o la lampada ad alcool nelle operazioni di isolamento e di trapianto dei microrganismi.** [An electrical apparatus to replace the Bunsen burner and alcohol lamp in isolating and transplanting micro-organisms.]—Reprinted from *Ann. Microbiol.*, 3, 4–6, 6 pp., 1 fig., 2 diags., 1947. [English summary. Received July, 1950.]

The author describes the construction of two small electric ovens of his own design, one for sterilizing platinum inoculating needles and the ends of the holders, and the other for the mouth of the test tube and the cotton-wool plug. The devices permit rapidity, regularity, and efficiency, especially in making serial transfers, but for general purposes they cannot completely replace the Bunsen flame.

Malan (C. E.). **Conservazione di preparati microbici con la vernice all' acetilcellulosa.** [The preservation of microbial preparations with a cellulose acetate varnish.]—Reprinted from *Ann. Microbiol.*, 3, 4–6, 3 pp., 1947. [English summary. Received July, 1950.]

The author preserves fixed, stained slide preparations of bacteria by covering the mount with a layer of cellulose acetate [*R.A.M.*, 29, p. 523] dissolved in acetone or in acetic acid. This rapidly drying varnish leaves a thin, adherent film which does not impede observation through the oil-immersion objective. Its insolubility in benzene and petroleum spirit allows the film to be washed with these substances, thus enhancing its preservative powers.

Galloway (L. D.) & Burgess (R.). **Applied mycology and bacteriology. Third edition.**—viii+184 pp., 8 figs., 1 diag., London, Leonard Hill, Ltd., 1950. 12*s*.

The present edition of this book [*R.A.M.*, 19, p. 613] has been largely re-written

by the first-named author to incorporate information on the many remarkable advances in microbiology made during the last ten years.

GROSSBARD (ERNA). **Antibiotics and plant protection.**—*World Crops*, 2, 5, pp. 194–197, 5 figs., 1950.

This is an interesting discussion on the nature and functions of antibiotics and their potentialities in relation to agriculture, exemplified by some striking instances of the control of plant diseases by their agency.

GOODMAN (J. J.). **Adaptive production of amylase and lipase by three species of fungi.**—*Science*, 112, 2,902, pp. 176–179, 4 graphs, 1950.

Aspergillus flavus, *A. terreus*, and a species of *Penicillium* tentatively identified as *P. notatum* were grown at room temperature in 250-ml. Erlenmeyer flasks containing 50 ml. of Czapek-Dox medium. Sucrose and soluble starch were compared as carbon sources for amylase production, and sucrose was compared with Mazola maize oil as a carbon source for lipase production. It was found that amylase and lipase were produced by the organisms adaptively, considerably more enzyme being produced when the organisms were grown in the presence of the specific enzyme substrated. The results suggest that the enzymatic activities of these fungi may be influenced by the substrate on which they are growing, and as they are commonly associated with the deterioration of stored grain, this influence of the substrate may be of some significance in grain deterioration as well as in the commercial production of enzymes.

SWART (E. A.), ROMANO (A. H.), & WAKSMAN (S. A.). **Fradicin, an antifungal agent produced by Streptomyces fradiae.**—*Proc. Soc. exp. Biol., N.Y.*, 73, 3, pp. 376–378, 1 graph, 1950.

An antibiotic designated fradicin, which is active only against fungi (including plant and animal pathogens), was isolated from the culture filtrate of *Streptomyces fradiae* at the New Jersey Agricultural Experiment Station. It withstands 30 minutes' exposure to a temperature of 100° C. at pH 7 and is soluble in various alcohols and in chloroform. The antibiotic was usually two to four times as toxic in culture broth to *Ceratostomella ulmi* as to *Trichophyton mentagrophytes* and *Candida albicans*.

DARPOUX (H.) & FAIVRE-AMIOT (A.). **Actions antagonistes de l'Actinomycète 105 sur quelques micro-organismes pour la plupart phyto-pathogènes. Essais d'application dans la lutte contre les maladies des plantes.** [The antagonistic action of Actinomycete 105 towards some micro-organisms, mostly phyto-pathogenic. Experiments on their application in the control of plant diseases.] —*Ann. Inst. Pasteur*, 76, 1, pp. 72–74, 1949. [Received July, 1950.]

Most of the information in this paper has already been noticed from other sources [*R.A.M.*, 27, p. 356; 29, p. 575]. In studies made at Versailles, Actinomycete 105 exerted a marked effect on bacteria grown on a medium consisting of 20 gm. peptone, 2 gm. glucose, 5 gm. sodium chloride, and 1 l. water. The medium remained clear when the actinomycete was sown at the same time as *Pseudomonas tabacum* or as *P.* [*Bacterium*] *mori* [loc. cit.], while the bacteria sown alone caused it to become clouded. The actinomycete inhibited markedly the growth in culture of *Endothia parasitica* isolated from a chestnut canker, *Sclerotinia cinerea* [*S. laxa*] isolated from plum and cherry, strains of *S. libertiana* [*S. sclerotiorum*] from carrot and sunflower, *Pyrenophora* [*Pleospora*] *calvescens* from opium poppy [ibid., 29, p. 433], *Alternaria brassicae* from sea kale, and *Trichothecium roseum*.

Cercós (A. P.). **Antibiótico DINR. 49–1 (fungocina) producido por 'Bacillus subtilis' con actividad sobre hongos patógenos de animales y vegetales.** [Antibiotic DINR. 49–1 (fungocin) produced by *Bacillus subtilis* with activity against pathogenic fungi of animals and plants.]—Reprinted from *Rev. Invest. agríc., B. Aires*, 4, 3, 13 pp., 1 pl., 1950. [English summary.]

Details are given of the mode of isolation, physiological properties, and toxicity to (*a*) human and animal and (*b*) plant pathogens of fungocin, secreted by *Bacillus subtilis* [*R.A.M.*, 28, p. 533]. The following, among other parasites of plants, succumbed to dosages of 10 μg. of fungocin per 5 ml. of the culture medium (potato dextrose broth): *Ustilago maydis*, *Tilletia caries*, *Cercospora beticola*, *Helminthosporium teres*, *Piricularia oryzae*, *Alternaria solani*, and *Septoria nodorum*.

Etchells (J. L.) & Bell (T. A.). **Film yeasts on commercial Cucumber brines.**—*Food Technol.*, 4, 3, pp. 77–83, 5 figs., 1950.

A taxonomic study was made of 47 yeast cultures associated in 1947 and 1948 with the production of surface films on 40 commercial cucumber pickle brines ranging in salt content from 5 to 19 per cent. and located in the States of North Carolina, Wisconsin, Indiana, Georgia, and Michigan. The cultures were classified as follows: *Debaryomyces membranifaciens* var. *hollandicus* 18; *D.* sp. 4; *Endomycopsis ohmeri* n.sp. 12; *Zygosaccharomyces halomembranis* n.sp. 9; and *Candida krusei* 4. A further 14 isolates of *Endomycopsis* obtained from films on cucumbers brined in the laboratory were accorded varietal rank in the new species as *E. ohmeri* var. *minor*. *Z. halomembranis* proved to be capable of forming heavy films on cucumber brines in five days.

Wolf (F. T.) & Wolf (F. A.). **Chemical agents for the control of molds on meat.**—*Mycologia*, 42, 3, pp. 344–366, 1950.

Experiments were carried out at Duke University, [North Carolina], on 31 chemical agents for the control of mould spoilage of meats [cf. *R.A.M.*, 23, p. 184]. The test fungi were *Penicillium crustosum*, *P. cyaneum*, *P. cyclopium*, *P. martensii*, *P. olivino-viride*, *P. waksmani*, *Aspergillus niger*, *A. sydowi*, *Cephalosporium* sp., *Hormodendrum cladosporioides*, and *Thamnidium chaetocladioides*, all isolated from meats and meat products in cold storage at Duke University [cf. ibid., 19, p. 219; 20, p. 546; 22, p. 445; 27, p. 251]. A survey of literature on chemical agents is given, the fungistatic properties in relation to toxicity to man being detailed. The minimum fungistatic concentration of each chemical was determined for each test organism in Czapek's solution and a glutamic acid basal medium. The chemicals with the greatest merit were found to be acetic acid 0·2 per cent., sodium diacetate 0·75, sodium caprylate 0·3, sodium undecylenate 0·1, methyl *p*-hydroxy benzoate 0·1, *n*-butyl *p*-hydroxy benzoate 0·02, thymol and oil of cloves 0·025 to 0·05, tetrachlorobenzoquinone 0·005 to 0·01, dichloronaphthoquinone 0·005 to 0·01, crotonic acid 0·1 to 0·15, sorbic acid 0·1, and trichlorophenyl acetate 0·005.

Greathouse (G. A.). **Microbiological degradation of cellulose.** *Text. Res. J.*, 20, 4, pp. 227–238, 1 diag., 3 graphs, 1950.

In this paper, presented at the 116th Meeting of the American Chemical Society, Atlantic City, in September, 1949, the author assembles unpublished data on the microbiological degradation of cellulose obtained during his period of service at the United States Department of Agriculture (1940 to 1943) and compares them with findings already published or available to him.

Cellulose-decomposing activity is widely but not universally distributed among fungi, and its exact mechanism is not known. Cellulose derivatives substituted at various positions in the molecule were evaluated for resistance to attack by one

of the most active cellulolytic organisms, *Myrothecium verrucaria* [*R.A.M.*, 29, p. 473]. Cellulose acetate (containing 9·3 per cent. or more acetyl), cellulose triacetate, ethyl cellulose (45·8 per cent. ethoxy), methyl cellulose (degree of substitution 2), and 6-cyanoethyl cellulose containing 1·7 CN groups per anhydroglucose unit were found to be completely resistant, as also were cellobiose octacetate and pentacetyl glucose. The results obtained suggest that the resistance of the cellulose molecule to attack by *M. verrucaria* is attributable to a chemical blocking of one or more of the alcoholic groups.

Atkins (W. G.), Sen Gupta (R. S.), & MacMillan (W. G.). **The relative efficiency of 'saturant' bitumen as a textile rot-proofing agent.**—*J. Soc. chem. Ind., Lond.*, 69, 2, pp. 61–65, 1 fig., 1 graph, 1950.

Prefabricated bituminous surfacing, i.e., jute fabric saturated with bitumen, was extensively used for temporary runways in airfields during the 1939 to 1945 war. An account is given of tests carried out under the auspices of the Indian Jute Mills Association Research Institute, Calcutta, to estimate the relative efficiency of bitumen and other substances used as textile rot-proofing agents. It was found that the treatment did not prevent the decomposition of yarns or textiles by micro-organisms (including fungi) under conditions of optimum humidity. Maximum protection was apparently provided by a preliminary application of cuprammonium (leaving less than 1·5 per cent. copper on the air-dried material), followed by bitumen saturation. However, where a 'one-process' method of proofing is required, the use of bitumen containing cresylic acid (2, 5, 10, and 20 per cent. concentrations were used in the tests) confers a reasonable degree of protection.

Ezekiel (W. N.). **Mycological problems in deterioration of military equipment.**—*Trans. N.Y. Acad. Sci.*, Ser. II, 12, 7, pp. 224–229, 1950.

This paper was presented to the Division of Mycology, New York Academy of Sciences, at a meeting held on 28th April, 1950. It reviews 14 contributions to the knowledge of the role of fungi and moisture in the extensive damage to military materials and equipment so prevalent in the second world war [cf. *R.A.M.*, 29, pp. 166, 323].

Fungal damage may entail visible decomposition and obvious failure of particular materials or parts; degradation of some important property without perceptible decomposition of the affected material or part; and damage to portions of an equipment beyond that supporting growth of the organism. The necessity is explained for clear recognition of general goals, e.g. 'funginertness' (a term coined by the writer to designate inherent nutrient inertness) as compared with fungistatic or fungicidal attributes of a material. Research and specification test procedures should be adapted both to the general approach and the particular material under investigation. [This information also appears in *Science*, 112, pp. 259–260, 1950.]

McQuilkin (W. E.). **Preservative treatments for cloth nursery-bed covers.**—*J. For.*, 48, 8, pp. 351–353, 1 graph, 1950.

Tests were started in 1942 in three tree nurseries in Maryland, Nebraska, and Michigan on treatments for preserving seed-bed covers [cf. *R.A.M.*, 29, p. 42]. The breaking strengths in lb. after 301 days, 52 days, and 108 days' service, respectively, in the three nurseries, over a period of three or four seasons of a coarse cotton netting were: for lead acetate plus potassium dichromate 53, 42, 39, copper naphthenate(0·6 per cent. copper)-asphalt-bentonite in water 45, 51, 63, quercitron 42, 46, 65, copper naphthenate-asphalt in naptha 41, 48, 62, fustic, 39, 50, 63, and with no treatment 38, 28, 44, compared with 72·3 for new cloth. No one treatment stands out as distinctly superior although the dyes and naphthenates

showed promise and merit further testing. The author states that treatment would probably, on the average, only double the service life of cloth but substantial savings are possible.

Reynolds (E. S.). **Pullularia as a cause of deterioration of paint and plastic surfaces in South Florida.**—*Mycologia*, 42, 3, pp. 432–448, 2 figs., 1950.

An abstract of this paper has been noted from another source [*R.A.M.*, 28, p. 299]. The high resistance to high temperature, dryness, and strong light of *Pullularia pullulans* may be related to its dark-coloured spores and ability to assimilate nitrogen. The dissemination of the spores is thought to be by air currents. Experiments are in progress on the source of inoculum and dissemination.

Kelley (A. P.). **Mycotrophy in plants.**—xiv+223 pp., 5 pl., 16 figs., Waltham, Mass., The Chronica Botanica Co., London, William Dawson & Sons, Ltd., 1950. $4.50.

The twelve lectures comprised in this treatise (Volume XXII of the new series of plant science books edited by F. Verdoorn) deal with the following aspects of mycotrophy in plants: (I) the rise of mycotrophic study; (II) the occurrence of mycorrhizae; (III) the fungal endophytes; (IV) fossil mycorrhizae; (V) distribution of mycotrophic plants; (VI) mycotrophic plants and their environments; (VII) mycothalli and mycorrhizomes; (VIII) mycodomatia; (IX) structure of mycorrhizae; (X) obligate symbiosis; (XI) theories of mycotrophy; and (XII) mycotrophic phagocytosis. A 23-page bibliography and indexes of subjects and plant names are appended.

Peyronel (B.). **L'Olpidium brassicae (Wor.) Dangeard nelle radici di Populus alba L.** [*Olpidium brassicae* (Wor.)Dangeard in the roots of *Populus alba* L.]—*Nuovo G. bot. ital.*, N.S., 56, 1–2, p. 239, 1949. [Received July, 1950.]

About 15 years ago the author found *Olpidium brassicae* [cf. *R.A.M.*, 19, p. 325; 28, p. 554] in the feeder rootlets of *Populus alba* in the Cascine Park, Florence. It had developed in abundance in many of the endotrophic mycorrhizal rootlets in both the vegetative state and as cysts of the *Asterocystis* type [ibid., 18, p. 821]. The epidermal cells were invaded as well as the root hairs. There was no trace of *Asterocystis* in the ectotrophic mycorrhiza.

Tatum (E. L.). **Effects of radiation on fungi.**—*J. cell. comp. Physiol.*, 35, *Suppl.* 1, pp. 119–131, 1950.

Ten recent studies form the basis of this discussion of the effects of radiation on fungi, with special reference to *Neurospora* [*R.A.M.*, 25, p. 310].

Kuprevicz (V. F.). Физиология больного растения в связи с общими вопросами паразитизма. [The physiology of the diseased plant in relation to the general questions of parasitism.]—299 pp., 5 figs., 13 graphs, U.S.S.R. Academy of Sciences, Moscow–Leningrad, 1947. [Received November, 1949.]

This work comprises two parts, the first (pp. 1–100) dealing with the general features of parasitism, the physiology of fungal parasites, the parasite-host relationship, and also, briefly, with bacterial and virus diseases and physiological disorders. The second part contains the results of the author's further investigations into the physiology of diseased plants [*R.A.M.*, 14, p. 52] preceded in each chapter by a comprehensive review of the literature. The additional hosts studied include potato infected with *Phytophthora infestans* and *Bacterium vesicatorium* [*Xanthomonas vesicatoria*], barley with *Ustilago nuda*, pedunculate oak with

Microsphaera alphitoides, oats with *Puccinia coronifera* [*P. coronata*], rye with *P. dispersa*, wheat with *P. triticina*, aspen and white poplar (*Populus tremula* and *P. alba*) with *Melampsora tremulae* and *M. populina*, respectively, black currant and pine with *Cronartium ribicola*, pistachio nut with *Septoria pistaciae*, a species of *Juniperus* with *Gymnosporangium fusisporum* (teleutospores), *Andropogon sorghum* [*Sorghum vulgare*] with *P. sorghi*, and *Psoralea drupacea* with *Leveillula taurica*. The virus diseases include potato rugose mosaic and streak [potato virus Y], and potato veinal mosaic (mild) [potato virus A], and rosette of ash (*Fraxinus americana*), a disease of unknown etiology, but probably of virus origin. This disease occurred in 1938 in ash plantings of the Central Botanical Gardens of the Academy of Sciences, Minsk, affecting 0·5 per cent. of 8-year-old trees. The diseased plants showed characteristic apical rosetting and were stunted, with a thin, usually bent stem. The leaflets were deformed, the margins often curled under, and in many cases covered with small, necrotic spots of various shapes. The root system was badly developed. Neither sap inoculation nor grafting transmitted the disease.

In chapter V on chlorophyll reductions, the percentage of chlorophyll in pea plants affected by *Mycosphaerella pinodes* was reduced by 39 per cent., in oak infected with *Microsphaera alphitoides* by 10 to 48 per cent., according to the severity of infection, in poplar with *Melampsora tremulae* (36 per cent.), in *Cirsium arvense* by *Puccinia suaveolens* [loc. cit.] (63 per cent.), and in Early Rose potatoes with *X. vesicatoria* (32 to 64 per cent.). Chlorophyll reduction occurred also in potato leaves affected by virus diseases (with the exception of potato aucuba mosaic), and in ash infected with rosette. The absolute chlorophyll losses depend on the type of disease and its severity, and also on external conditions. The decrease is brought about either by direct destruction of chloroplasts by the mycelium, or by the suppression of the synthesis of the protein basis of the plastids. The process is accompanied by a sharply increased oxidation activity in the chlorophyllous tissue.

In chapters VI and VII it is shown that the photosynthetic activity of pea leaves infected with *Mycosphaerella pinodes* did not differ much from that of healthy plants. Oak leaves attacked by *Microsphaera alphitoides* showed a markedly decreased photosynthesis, assimilation of carbon dioxide (in diffuse light) being only 40 to 60 per cent. of that of healthy leaves. Decreases in photosynthetic energy were also observed in clover and lupin infected with *E. communis* [cf. ibid., 28, p. 350]; in an experiment carried out on the 27th of July, the leaves of the latter assimilated during a five-hour period 42·02 mg. carbon dioxide, compared with 86·4 mg. for healthy leaves. Slightly infected plants assimilated 100·41 mg. in six hours and healthy 120·26 mg. Photosynthesis of *C. arvense* plants infected with *P. suaveolens* was reduced by about 50 per cent. Poplar leaves infected with *Melampsora tremulae* assimilated during a six-hour period 29·8 mg. carbon dioxide, healthy leaves 34·8 mg. The results show that mildew and rust infections always decrease photosynthetic efficiency, with simultaneous chlorophyll reductions. Photosynthesis of Early Rose potatoes affected by *X. vesicatoria* was markedly reduced, the carbon dioxide assimilation being only about 70 per cent. of that of healthy plants. In potatoes infected with leaf roll the photosynthesis was reduced by 39 to 40 per cent. The greatest differences in photosynthetic activity between healthy and diseased leaves occurred in the morning, when photosynthesis was most intense. In potatoes infected with virus Y and virus A the photosynthetic activity fluctuated sharply, depending on temperature and external disease symptoms.

Chapter VIII deals with respiration. Wohltmann potatoes slightly infected with *P. infestans* showed an increased rate of respiration. An insignificant increase was observed in Victoria peas affected by *Mycosphaerella pinodes* (average infection). Respiration of oak leaves affected by *Microsphaera alphitoides* was greatest in

average infections; that of severely or slightly diseased leaves was somewhat less but higher than in healthy ones. The differences in respiration intensity were most pronounced at high temperatures. There were no essential differences in respiration rates between healthy clover plants and those affected by *E. communis*. The respiration rate of plants affected by rust fungi was increased in all cases. In *C. arvense*, slightly infected with *P. suaveolens*, it was greater by 7 per cent., in severely affected ones by 59 per cent. Analogous results were obtained with oats affected by *P. coronata*, and currants by *C. ribicola*. In potato leaves with severe leaf roll the respiration rate was decreased by 14 to 25 per cent., the greatest reductions occurring in medium-aged leaves. In young leaves with mild symptoms the respiration rate was the same as in healthy leaves. On the other hand, in potatoes infected by virus Y it was more or less increased only in comparatively young leaves with severe rugose mosaic symptoms. There was a decrease in respiration intensity in the older infected leaves. In leaves with severe streak symptoms the respiration rate was increased by 29 to 34 per cent. In ash leaves severely infected by rosette it was increased by 41 per cent., in slightly infected ones by 7 to 12 per cent.

All plants infected by fungi assimilated less respiratory carbon dioxide (in the light) than healthy ones. Tests with plants infected by virus diseases showed similar results, except for old potato leaves affected by aucuba mosaic, where the reverse obtained.

In chapter IX on carbohydrate and nitrogen metabolism, the accumulation of carbohydrates in unshaded leaves of *C. arvense* affected by *P. suaveolens* is stated to be generally 18 per cent. lower at 9 a.m. than in healthy ones. After five hours the accumulation was 24 per cent. less and during the same period the relative starch content decreased by 25 per cent. The relative content of disaccharides was also decreased, but that of monosaccharides increased. The sugar content of cell sap from leaves and stems of infected plants was correspondingly less. The reverse was observed in barley infected by *U. nuda*, an extract from which contained 22 per cent. more sugars than that from healthy ones. Extracts from winter rye leaves affected by *P. dispersa* contained 10·2 per cent. less sugars. Amylolysis in plants infected with *P. suaveolens* and *U. nuda* was somewhat increased. In the first half of the growing period the carbohydrate content of potato plants infected with rugose mosaic was decreased by 45 per cent. compared with healthy plants, mainly at the expense of starch, but at the end of the growing season there was 14 per cent. more than in healthy plants. The accumulation of assimilates was very marked in potatoes affected by leaf roll [cf. ibid., 28, p. 208]. At 10 a.m. diseased leaves contained 304·3 mg. carbohydrates per gm. dry matter compared with 123·8 mg. in healthy ones, and translocation was 11·6 and 36·8 mg., respectively.

No essential differences were observed in the activity of protease in healthy and diseased tissues. The catalase activity in plants affected by fungal, bacterial, and virus diseases was in most cases decreased. Rusts on oats, wheat, *C. arvense*, and poplar decreased the activity of the enzyme in affected tissues. The same occurred in potatoes infected with *X. vesicatoria*. An exception was *E. communis* on lupin. In potatoes infected with virus Y the activity of catalase was decreased, with leaf roll increased. A negative correlation was observed between the activity of catalase and respiration activity. The activity of bios [biotin] in water extracts from potato leaves is least in varieties most resistant to *P. infestans* and greatest in very susceptible varieties. Water extracts from oats infected with *P. coronata* also depressed the multiplication of yeast cells most markedly in the case of the most resistant variety. Leaf extracts from plants affected by virus diseases induced a sharp decrease in the multiplication of yeast cells, especially extracts from leaf roll infected potato.

Investigations into the water status of diseased plants (chapter X) were carried out in 1944–5 in Tadzhistan under very hot and dry conditions. Leaves of all

infected plants, including those of pistachio nut affected by *Septoria pistaciae* and ash by a species of *Cylindrosporium*, had a reduced water content and rate of transpiration. A considerable increase in the dissolution of organic substances occurred in diseased tissues of all hosts studied, being on the average 1½ to 2 times higher than in healthy ones. The permeability of the host tissue was invariably increased.

Chapter XI deals with studies on black heart of potato tubers [ibid., 28, p. 473]. This physiological disorder was widespread and severe in U.S.S.R. in 1937, affecting often 90 per cent. of stored tubers. Wohltmann was the most susceptible, while Early Rose, Silesia, and Epicure were less affected than Deodar. From the results so far obtained and from the present investigations it is concluded that black heart may be caused by unfavourable conditions during storage and transport, as well as by unfavourable soil and climatic conditions. The enzyme system in the diseased cell appears to be disturbed, and the cells show general activity as in autolysis. The phenolase and catalase activity are increased, and in the early stages of disease development there is also an increase in the amino-acid content, mainly at the expense of tyrosin. This is connected with a sharp increase of carbon dioxide in the tissues and an insufficient supply of oxygen. With increasing discoloration of the diseased tissue (due to the transformation of tyrosin into black melanin) [ibid., 8, p. 598] the tyrosin content decreases. During respiration the production of carbon dioxide is slightly lowered, and the amount of used oxygen sharply decreased. The results of experiments confirmed previous findings [ibid., 9, p. 54] that potassium deficiency in the soil had a direct effect on the incidence of black heart.

In the concluding chapter (XII) the parasite-host relationship is summed up, and the origin of parasitism, its progressive evolution, and the pathological process are briefly discussed.

A 14-page bibliography is appended.

Baerecke (Maria-Luise). **Erfahrungen mit Physalis floridana Rydb. und Physalis angulata L. als Testpflanze für das Blattrollvirus der Kartoffel.** [Tests with *Physalis floridana* Rydb. and *Physalis angulata* L. as indicator plants for the Potato leaf roll virus.] –*Züchter*, 20, 3–4, pp. 99–102, 4 figs., 1950.

The results of experiments at the Max Planck Institute for Breeding Research, Voldagsen, Germany, confirmed the suitability of *Physalis floridana* and *P. angulata* as indicator plants for potato leaf roll virus [*R.A.M.*, 28, p. 78]. Both species react to inoculation by acute and clear-cut symptoms, including phloem necrosis. The best time for tests on *P. floridana* is during the formation of the first and second foliage leaves, when recognizable symptoms appear within eight to ten days.

The following method has proved effective in practice. For each individual plant to be tested, three to five *P. floridana* seedlings in the cotyledonary stage are transplanted to small pots. From the potato test plants leaves are transferred to glasses or Petri dishes or cuttings to sandy soil; sprouts germinated in light or darkness may also be used. These organs are colonized with 10 to 15 individuals from a stock culture of *Myzus persicae*; after three days the aphids are transferred to *P. floridana* plants, which have previously been copiously watered and after inoculation are enclosed in cellophane bags. Three days later the aphids are killed with the insecticide E605 f. It is preferable, however, to transplant the seedlings once again into a box, both to ensure more rapid symptom development (since only the healthy plants survive a second disturbance of the roots and daily outstrip the diseased ones), and to provide the maximum uniformity possible in environmental conditions. *P. floridana* is susceptible to *Phytophthora infestans* and should be sprayed with Bordeaux mixture if there is any risk of infection.

Klinkenberg (C[aroline] H.), Kronenberg (H[ester] G.), & Erkelens (M. A.). **Voorjaarsbont in het Aardbeiras Madame Moutot.** [Spring variegation in the Madame Moutot Strawberry variety.]—*Fruitteelt*, 40, 24, pp. 460–461, 1 fig., 1950.

The first-named writer describes the symptoms and effects on growth and yield of spring variegation, an hereditary defect affecting the Madame Moutot strawberry variety in Holland [cf. *R.A.M.*, 28, p. 180], and the others deal with the problems introduced by this anomaly into the work of selection. The variegation disappears in the summer months but may easily be mistaken for a virus disease. Other varieties very occasionally affected in Holland are Oberschlesien, Scarlet, and presumably Deutsch Evern. Cold weather intensifies the symptoms of spring variegation and is, in fact, essential to reliable selection for freedom from the disease.

Fries (N.). **Growth factor requirements of some higher fungi.**—*Svensk bot. Tidskr.*, 44, 2, pp. 379–386, 1950.

In continuation of previous studies [*R.A.M.*, 18, p. 335], the author investigated the growth factor requirements of four Ascomycetes and 21 Basidiomycetes. Thiamin was found to be the only substance absolutely essential to the growth of the selected species on the glucose mineral salt medium used for the tests. The addition of adenine at the rate of 1 mg. per 25 ml. to the basic medium plus 1 μ gm. thiamin resulted in an increase of the mycelial dry weights of *Lenzites betulina* and two strains each of *Polyporus* [*Polystictus*] *abietinus* and *Polyporus* [*Fomes*] *annosus*. The weight of *L. betulina* was also raised by casein hydrolysate [ibid., 28, p. 411] at a dosage of 21 mg. per 25 ml.

Münster (J.). **Lutte préventive contre les viroses de la Pomme de terre.** [Preventive control of virus diseases of the Potato.]—*Rev. romande Agric., Vitic., Arboric.*, 6, 7, pp. 49–51, 1950.

In further work on potato virus diseases at Beau-Cèdre, [Switzerland: *R.A.M.*, 29, p. 577], haulms of Bintje and Erdgold potato plants were treated after 79 days' growth with 3 per cent. M 116 (DNC), 2 per cent. sandoline A, and 2 per cent. sodium chlorate, each at 2,000 l. per ha.; others were pulled off or left intact. At harvesting on 7th September three tubers from each plant were retained for planting in 1950. The 1949 season was very favourable to aphids, 2,540 being counted on 100 leaves of Bintje and 1,470 on Erdgold on 22nd July; on an average 90 per cent. of the insect population consisted of *Doralis* [*Aphis*] *rhamni*.

At harvest in 1950, 56 per cent. of the plants from Bintje tubers untreated in 1949 had serious virus disease (leaf roll and mosaic due to viruses A and Y), while those from the plants whose haulms had been pulled up showed only 2·7 per cent. The figures for the chemical treatments were, respectively, 13·7, 15·7, and 20 per cent. On Erdgold the corresponding figures were 63·3, 6·3, 67·7, 60·7, and 88·3 per cent.

Thus, with both varieties pulling up the haulms gave satisfactory results, and had the operation been carried out ten days earlier it is certain that virtually no virus disease would have been present [cf. ibid., 28, p. 536]. Sodium chlorate reduced the germination index of Erdgold from 4·6 (for plants whose haulms were pulled up) to 1·5.

Van der Merwe (W.). **The production of high-grade seed Potatoes.**—*Fmg S. Afr.*, 25, 289, pp. 109–113, 5 figs., 1950.

In this survey of the seed potato production situation in the Union of South Africa and the reasons for the establishment of the Riet River Settlement area [*R.A.M.*, 24, p. 384; 29, p. 290] it is stated that neighbouring areas along the Moder, Riet, Vaal, and Orange rivers are to be used for the production of healthy seed potato stocks. The whole project is so organized that these areas can supply

annually as many bags as possible of high-grade or stock seed and render the industry in times of emergency independent of importations of seed tubers. The main object is to keep foundation seed pure and disease-free. This is done at a suitable centre, where the foundation seed is multiplied in sufficient quantities to be supplied to growers, who again multiply it once or twice, selling the end-product as high-grade stock seed. A small number of Up-to-Date tubers free from virus X [ibid., 28, p. 305] were carefully multiplied and formed the foundation of the seed now being produced in these areas. Annually a few hundred tubers of the foundation stock are sent to Pretoria to be tuber-indexed [cf. ibid., 26, p. 414; 28, pp. 479, 537] and tested for freedom from virus diseases. The tested tubers are multiplied at the Agricultural Research Station, Riet River. After three to four multiplications there is enough seed to meet local requirements. During the whole process of reproduction and multiplication great care is taken to eliminate virus diseases. At planting use is made of the tuber-unit method [loc. cit.], while the most rigorous precautions are taken against other diseases and pests. The growers of the seed potatoes are subject to the strictest regulations in regard to the production of such stock seed and may plant only foundation seed supplied by the Riet River Agricultural Research Station.

In addition, intensive inspections of the fields and harvested tubers are carried out by officers of the Department of Agriculture to ensure that the certificated stock-seed potatoes are not only free from all skin diseases and pests but also that such tubers do not contain more than a fixed maximum (0·5 per cent.) of leaf roll virus.

Hutton (E. M.). **The significance of the necrotic phloem reaction in the Potato to the leaf-roll virus.**—*Aust. J. sci. Res.*, Ser. B., 2, 3, pp. 249–270, 2 pl., 1949.

In order to develop seedlings resistant to leaf roll virus [*R.A.M.*, 29, p. 426] a study was made in Australia of the reactions of potato varieties and their seedlings to this virus. Leaf roll infection was estimated by the amount of phloem necrosis present, as determined by a modified phloroglucin test [loc. cit.]. The reagent consisted of 40 per cent. sulphuric acid and 2 per cent. phloroglucinol in 50 per cent. alcohol. Phloem necrosis as developed in a series of 20 potato varieties sprout inoculated by infestation with *Myzus persicae*, either immediately prior to planting or in the previous season, was shown to be a varietal character. President, Pawnee, Pioneer Rural, and Snowflake had 50 per cent. necrosis, Robin Adair, Brownell, Potomac, Factor [Up-to-Date], and North Carolina 20 per cent. or less. Although the extent of phloem necrosis is influenced by environmental conditions, for example, it is less under greenhouse conditions than in the field, variety is still one of the major factors governing the reaction. In order to obtain reliable data on this character, however, it is necessary to use material which has been infected for at least one season. When plants were grown in loam and in sand the external leaf roll symptoms were obvious in the latter and although masked or indeterminate in the former the differences in phloem necrosis between varieties were significant. Although there is a general correlation between the severity of leaf roll symptoms and the extent of phloem necrosis, plants with masked symptoms having less than 30 per cent. necrosis and those with marked leaf roll having over 50 per cent., it is possible to have relatively severe external symptoms together with a low level of phloem necrosis.

Trials on the effect of the leaf roll virus on the field growth of potato varieties in 1947–8 showed that growth depression in some varieties is more marked in the second season than in the first after sprout inoculation. Under the experimental conditions used it was found that in some varieties depression of growth reaches an equilibrium after one year's infection, whereas in others loss of vigour progresses according to the number of years they have been infected.

As there is no variety immune from leaf roll, it is considered that at present the best programme is to attempt to secure one with high initial resistance and a severe reaction once infection has been established. Work on some varieties reported to be field-resistant showed that the reaction of President, Arran Crest, Snowflake, and Arran Signet was stabilized and severe. These, therefore, were used as parents for breeding resistant hybrids on the hypothesis that such definite reactions must have a well-defined genetic basis. Bismark gave rise to clonal lines of varying reaction. Skerry Champion reacted persistently with mild symptoms and low phloem necrosis.

Breeding experiments substantiated this hypothesis, Bismark crosses giving a low percentage of severe reactors, and Snowflake crosses a higher percentage. Even so, relatively few of the progeny showed extreme sensitivity, with severe external symptoms and 60 to 80 per cent. phloem necrosis (4 out of 53). Only these have been retained for further crossing experiments.

KOEHNKE (M.). **Report of seed Potato certification and regulation in the U.S.A. and Canada.**—*Amer. Potato J.*, 27, 6, pp. 236–237, 1950.

The changes made in the last two years or about to be made in the seed potato certification regulations in the United States include lower tolerance limits for various virus diseases and alterations in requirements for growth in isolation.

ŠÍP (V.). **Snižování výnosu Bramborů virosami.** [Yield reductions of Potatoes owing to viroses.]—*Ochr. Rost.*, 22, 1–2, pp. 38–44, 1 fig., 1949. [English summary.]

A tabulated survey is given of comparative investigations in Czechoslovakia in 1942 and 1948 to determine the relative yield reductions of potato plants infected with severe virus diseases, together with the effect on total yield.

Leaf roll [*R.A.M.*, 17, p. 335] and streak (rugose mosaic) [virus Y: ibid., 28, p. 301] caused yield losses in various localities of 65 to 80 per cent., crinkle [virus X+virus A: ibid., 15, p. 392] 35 to 55 per cent., while no reduction was caused by mild mosaic [virus X: ibid., 29, p. 224]. The yields of plots are markedly decreased if disease incidence is more than 20 per cent., the losses being further aggravated by early harvesting and unfavourable growing conditions. Under favourable conditions healthy plants may balance the losses, but only healthy seed should be used in order to obtain high and constant yields.

RIPPEL (K.). **Nochmals zur Frage der Inaktivierung des Blattrollvirus und der Überführung des Blattrollvirus in A-Virus bei Solanum tuberosum.** [A further contribution to the question of the inactivation of the leaf roll virus and of the transformation of the leaf roll virus into virus A in *Solanum tuberosum*.]—*Naturwissenschaften*, 37, 5, p. 116, 1950.

The writer repeated his previous experiments at the Bavarian Plant Breeding Institute, Weihenstephan, on the inactivation of the potato leaf roll virus by the introduction of nucleic acid into the tubers [*R.A.M.*, 29, p. 378] in May and June, 1949, using the same variety (Green Mountain) and in addition the leaf roll-infected Kameke. In this series, moreover, yeast autolysate (containing nucleic acid) was tested as well as nucleic acid and papayotin. In all the tests two lots of 15 treated diseased tubers were planted out and one of 15 diseased untreated.

At first the infected Green Mountains treated with nucleic acid and yeast autolysate appeared healthy, but before flowering the leaves developed slight rolling. On the other hand, the treated Kameke plants showed all the symptoms of leaf roll and were indistinguishable from the controls. Papayotin exerted no effect on Kameke or on two-thirds of the treated diseased Green Mountains, whereas the remaining third of the latter developed A-virus symptoms.

The implications arising out of this further demonstration of the lability of the 'virus' concept are briefly discussed in the light of some relevant contributions to the literature.

Gould (C. J.) & Randall (T. E.). **Potato tuber disinfection tests in Western Washington.**—*Amer. Potato J.*, 27, 7, pp. 249–256, 1950.

Three years' tests in Western Washington in which certified White Rose potatoes were disinfected against scab [*Actinomyces scabies*] and *Rhizoctonia* [*Corticium solani*] with hydrated lime dust, sulphur dust, lime plus sulphur dust 50–50, mercuric chloride (1 oz. in 7½ gals., 90 mins.), semesan bel, wettable spergon, ferbam, thiuram, and He 175 (nabam) (all at 1 lb. in 7½ gals. for 1 min.), one lot being treated before being cut, a second lot being cut and treated the same day, and a third a week after cutting, showed that under the conditions experienced no increase in stand or yield can be expected from treated potato seed pieces, regardless of planting date. There were no differences in yield of U.S. No. 1 potatoes attributable to treatment or to differences in stand, except in the case of mercuric chloride and He 175, which caused a significant reduction in stand and total yield, but not of No. 1 tubers. In all the plantings in all years the seed piece type which produced the best stand also produced the highest yield of No. 1 tubers and the largest total yield. These results support the view that the disinfection of seed potatoes is frequently not profitable [*R.A.M.*, 23, p. 508].

Frutchey (C. W.). **What are the real values and facts of seed Potato certification?** —*Amer. Potato J.*, 27, 7, pp. 245–249, 1950.

The author sets out the advantages accruing from the production of certified seed potatoes [*R.A.M.*, 29, p. 376], including both the financial and non-financial gains and the elimination of various destructive diseases. The doubling of the yield in the United States since 1920 is largely due to certification and there is no doubt that it raises the standard of production even when it is of no immediate advantage to the grower.

One drawback is that growth-type and uniformity of stand and growth have not been taken into account. Also, in some cases, certification is too strict about disease. It allows no ring rot [*Corynebacterium sepedonicum*], but shows almost unlimited tolerance of black leg [*Erwinia phytophthora*], which causes greater loss; crops with a trace of ring rot should be allowed to carry a 'limited, non re-certifiable' tag.

Ciccarone (A.). **Osservazioni sulle epifizie di Phytophthora infestans (Mont.) de Bary nel Valle de Aragua, Venezuela.** [Observations on the epiphytotics of *Phytophthora infestans* (Mont.) de Bary in the Valley of Aragua, Venezuela.]—*Riv. Agric. subtrop. trop.*, 43, 1–3, pp. 22–28, 1 graph, 1949. [English summary.]

In Aragua, Venezuela, potatoes are grown at all elevations during the dry seasons (September–October to March–April), but during the rainy period their cultivation is confined to the lower altitudes. In recent years these latter plantings have been made on a reduced scale as a result of outbreaks of *Phytophthora infestans* [*R.A.M.*, 29, p. 479, and next abstract]. Potatoes are planted in the first half of May and growers state that *P. infestans* does not appear until the plants are 60 days old and tuber formation has already begun; at this date the fungus is not yet favoured by environmental conditions. A further week or more is likely to elapse before the amount of inoculum becomes very great, and if no serious development occurs before the plants are 75 to 80 days old, the crop is then harvested and the high price obtained makes up for the low weight. Light rains interspersed with pale sunlight, and hot, heavy, motionless air are conducive to disease development, and such conditions occurred in July, 1948, near Valencia (Nagua Nagua, Puente Reboto, Hacienda Barbula), at an altitude of 500 to 600 m. The temperatures ranged from 20° to

30° C. In the least serious cases of infection the assimilating leaf surface was reduced by 35 to 40 per cent., and in the most serious 50 to 60 per cent. of the stems were already dead and dried up. In some fields every leaf was infected and the crops abandoned. It appears that in the dry season serious epidemics can occur, especially at high altitudes. Factors favouring spread are the particular environmental conditions, the profuse wild vegetation, and the presence of semi-wild solanaceous plants. In a saturated atmospheric humidity at 18° to 25° a lesion forms mature sporangia in about 6 hours and these give 40 to 50 per cent. indirect germination at 18° and 5 per cent. less at 24° in 1½ to 2 hours. The zoospores germinate in 2 to 2½ hours and penetrate the epidermis, becoming established in 3 to 4 hours. In a tropical night (normally rainy) of 12 hours *P. infestans* can pass through every stage from the development of the sporangiophores to the establishment of fresh infections.

Under the prevailing local conditions spraying presents too many difficulties to be recommended at present. Growers are advised to plant more suitable crops. Careful attention should be given to ascertaining the best planting times in the different localities and in suitable places field tests on control should be carried out.

Ortega (R.). **Variedades de Papas resistentes a la 'candelilla' (Phytophthora infestans) adaptadas a los Andes venezolanos.** [Varieties of Potato resistant to blight (*Phytophthora infestans*) adapted to the Venezuelan Andes.]—*Agric. venez.*, 13, 139, pp. 43–46, 2 figs., 1950.

Blight (*Phytophthora infestans*) is a limiting factor in Venezuelan potato production [see preceding abstract], and experiments have been in progress since 1942 in the Andes to develop resistant varieties. For the past three years the hybrids Glenmeer (seedling DAB/18) [*R.A.M.*, 28, p. 352], Chama (seedlings DAB/18 and EOJ4), Timotes (seedling DOS/1), and Motatan (seedling FAL/11) have remained virtually immune from the disease at Timotes (State of Merida), situated 2,018 m. above sea-level. Conditions during the growth of the crops planted in January, 1949, were ideal for the development of *P. infestans*, and the European varieties Alpha, Eigenheimer, Alma, Saskia, and Bintje, and the American Sebago [cf. ibid., 28, pp. 539, 638], Bliss Triumph, Katahdin, and Pontiac were entirely destroyed; Furore (European) showed a measure of resistance. Glenmeer showed slight infection, but not until after the production of an excellent crop.

Black (W.). **Inheritance of resistance to blight (Phytophthora infestans) in Potatoes: Strain C and its relationships.**—*Proc. roy. Soc. Edinb.*, Sect. B, 64, Part II, 10, pp. 216–228, 1950.

In further studies on potato blight (*Phytophthora infestans*) at the Scottish plant breeding station [*R.A.M.*, 29, p. 275] the effects of strain C [ibid., 27, p. 151] were investigated. This strain appeared on seedling 877a (34) [loc. cit.] resistant to strains A and B. The seedling parents used in these experiments were all resistant to A, some were resistant to B but susceptible to C, others susceptible to B but resistant to C and others resistant to both B and C. Seedlings of W. 800 (2), which were resistant to A and C possessed a gene designated Rc. Plants containing Rbc were resistant to A, B, and C. The C strain is more virulent than both A and B since it attacks plants resistant as well as susceptible to these strains. The difference in B and C was found to be of a qualitative nature the two strains differing in type of pathogenicity rather than degree of virulence. B and C probably arose from strain A by mutation. Mutants of the C type appeared less frequently than those of B. Under test conditions specialized strains of blight may alter in virulence, but each can be maintained unchanged in continuous culture on a host plant to which it is adapted. Deviations from standard Mendelian ratios were consistent in their trend towards an excess of recessive individuals when *Solanum*

tuberosum plants were crossed with resistant hybrid derivatives of *S. demissum*, but less evident when such derivatives of *S. demissum* were intercrossed.

Callbeck (L. C.). **Late blight of Potatoes and its control.**—*Fmrs' Bull. Canad. Dep. Agric.* 162, 15 pp., 3 figs., 1950.

An account is given in popular terms of the symptoms, cause, and control of potato late blight (*Phytophthora infestans*) [*R.A.M.*, 29, pp. 430, 529], with directions for preparing Bordeaux mixture.

Rudorf (W.), Schaper (P.), Ross (H.), Baerecke (Marie-Luise), & Torka (Margarete). **The breeding of resistant varieties of Potatoes.**—*Amer. Potato J.*, 27, 6, pp. 222–235, 3 figs., 1950.

After a brief survey of the history of the breeding of potatoes for resistance to blight (*Phytophthora infestans*), the authors describe the studies on specialization and methods of selection carried out at the Max Planck Institute, Voldagsen, Germany, from 1936 [*R.A.M.*, 17, p. 765] to 1945 and 1947 to 1948, much of which has already been reported from another source [ibid., 29, p. 579].

Tests of wild species with eight biotypes [loc. cit.] showed that *Solanum verrucosum* consists of lines ranging from wholly susceptible to wholly resistant and resistant seedlings must be tested by selfing. Within *S. ajuscoense* and *S. antipoviczii* the existence of lines resistant and susceptible to single biotypes has been proved. *S. polydenium* offers new possibilities since it has been hybridized with *S. tuberosum*; blight-resistant F_2 hybrids were selected in 1948. This species is equally important as a resistant parent in selection for virus resistance. The hybrid *S. demissum* × *S. verrucosum* with 48 chromosomes shows promise for hybridization with *S. tuberosum*. The selected resistant lines of *S. ajuscoense* and *S. antipoviczii* are difficult to hybridize with *S. tuberosum*, but some hybrids have been obtained and show promise for the selection of varieties resistant to late blight.

Most of the hybrid clones selected for resistance in 1947–8 resulted from hybridization with forms of *S. demissum*. As a result of foliage and tuber tests with race 48/1 in 1947, of 358 clones tested 12 were resistant in foliage and 16 were highly resistant in foliage and tubers. In 1948 heavy natural infection occurred in the nursery. All 28 clones selected as resistant on a basis of artificial infection remained unaffected. Of 232 hybrid clones infected with 48/1, 157 had resistant foliage, and of these, 85 were classified as free from attack under severe natural infection. Another series of hybrid clones tested with four populations of *P. infestans* of different virulence gave 21 with complete resistance.

Zakopal (J.). **Výsledky zkoušky na vzdornost k rakovině Bramborů u některých odrůd ze světového sortimentu.** [The results of a test for resistance to Potato wart of some varieties from world selections.]—*Ochr. Rost.*, 22, 1–2, pp. 60–63, 1949. [English and Russian summaries.]

In 1948 the Research Institute for Plant Pathology and Protection, Brno, Czechoslovakia, tested various foreign potato varieties at Velké Karlovice for their resistance to wart disease (*Synchytrium endobioticum*) [*R.A.M.*, 25, p. 464; 28, p. 192; 29, p. 637] in a heavily infested field. The following were immune: Alpha [ibid., 25, p. 78], Bevelander, Furore, Gelblom, Gloria, Ijsselster, Libertas, Matador, Meerlander, Nederlander, Noordeling, Orion, Record [ibid., 28, p. 193], and Ultimus from Holland; Houma and Ontario from the United States; Kaměras 1 and Kaměras 2 from U.S.S.R.; and Arran Cairo, Bresse, Consum, Feldsonne, Flourball, Fulda, Golden Marvel, Great Scot, Green Mountain [ibid., 23, p. 276], Herald, Immuse Ashleaf, King George [ibid., 21, p. 158], Lenino, Magneto, and Response of unknown origin.

Vielwerth (V.). **Příspěvek ke studiu vzniku různých forem strupovitosti obecné na Bramborech.** [A contribution to the study of the origin of various forms of common scab of Potato.]—*Ochr. Rost.*, 22, 1–2, pp. 28–37, 3 figs., 1949. [Russian and English summaries.]

In experiments carried out in 1948 at the State Potato Experiment Station, Havlíčkův Brod, Czechoslovakia, the potato variety Keřk. Erstling [Duke of York], highly susceptible to all forms of scab (*Actinomyces scabies*) [*R.A.M.*, 26, p. 508], was grown in naturally infested plots, fertilized with: (1) stable manure (autumn or spring applications), (2) peat, and (3) forest soil. All materials, but especially the forest soil reduced deep and pustular scab, total incidences being 76·78, 69·84, 61·17, and 38·1 per cent., respectively, compared with 83·74 per cent. for the untreated. Shallow scab increased at the same time, the respective percentages being 27·36, 39·43, 33·1, 54·54, and 26·42.

The results demonstrate that the various forms of the disease are caused by certain species or strains of *Actinomyces* specific for each type of symptoms [ibid., 29, p. 639] and they are suppressed or stimulated by unknown substances present especially in the humus soil. The results also showed that attack does not depend on soil pH [cf. next page].

Sethofer (V.) & Král (C. J.). **Závislost aktinomykosní strupovitosti Brambor na poměrech půdních.** [The dependence of common scab of Potatoes on soil conditions.]—*Ochr. Rost.*, 22, 3–4, pp. 86–105, 1949. [Russian summary.]

To determine which soil conditions influence the occurrence of common scab [*Actinomyces scabies*: see preceding abstract], 109 soil samples and affected tubers from various parts of Bohemia, Czechoslovakia, were examined [? in 1948]. Actinomycetes were usually active when conditions were unfavourable for the development of *Spongospora* [*subterranea*: see next abstract] and in the absence of *Azotobacter* [*R.A.M.*, 27, p. 41]. They were predominant in light soils with large particles, which mostly did not contain calcium carbonate, but harboured numerous sporulating anaerobic bacteria of the lactic acid group. Soil reaction had no effect on incidence. The anti-microbial and antibiotic activity detected by the authors in 1942 in ultimate soil particles free from actinomycetes, was also demonstrated by Novogradsky and Mme Novogradska (микробиология [*Microbiology*], 16, 2, 1947; 17, 3, 1948). Calcium carbonate (especially above 0·06 per cent.) decreased the virulence of the pathogenic actinomycetes [cf. next page]. The use of badly stored manure ('straw') greatly increased the incidence and virulence.

Vielwerth (V.). **O spongosporové strupovitosti Bramborů.** [On powdery scab of Potatoes.]—*Ochr. Rost.*, 22, 3–4, pp. 77–86, 4 figs., 1949. [English summary.]

Although powdery scab of potatoes (*Spongospora subterranea*) [C.M.I. map No. 34; *R.A.M.*, 26, p. 508 and preceding abstract] is of no economic importance in Czechoslovakia (the scab lesions being only superficial), incidence is important in regard to the export of seed potatoes. The severity and distribution of the disease were investigated from 1944 to 1948 inclusive in 50 localities in Bohemia, Moravia, and Slovakia. The survey showed that incidence was highest in cool and moist areas at high altitudes, especially in wet years. Powdery scab was almost absent in warm lowlands. Of the 30 local varieties tested Květuše was the most resistant early variety, followed by Primula, Kardinál and Keřk. rohlíčky. Of the mid-late to late varieties the most resistant were (in decreasing order) Kotnov, Flora, Parnasia, Bojar, and Figna.

Hooker (W. J.), Sass (J. E.), & Kent (G. C.). **Stem necrosis of Potatoes caused by Streptomyces scabies.**—*Phytopathology*, 40, 5, pp. 464–476, 5 figs., 1950.

This is an amplified, tabulated survey of studies at the Iowa Agricultural

Experiment Station on potato stem necrosis caused by *Streptomyces* [*Actinomyces*] *scabies*, some preliminary results of which have already been noticed [*R.A.M.*, 27, p. 294]. The development of stem necrosis by inoculations affords a ready and reliable means of identifying pathogenic cultures of *A. scabies* and of testing for resistance.

Odland (T. E.) & Allbritten (H. G.). **Soil reaction and calcium supply as factors influencing the yield of Potatoes and the occurrence of scab.**—*Agron. J.*, 42, 6, pp. 269–275, 1950.

This is a tabulated survey of two investigations at the Rhode Island Agricultural Experiment Station to determine the influence of soil reaction and additions of calcium with the fertilizer on Green Mountain potato yields and scab [*Actinomyces scabies*] development [*R.A.M.*, 26, p. 77]. The soil reaction was adjusted by the use of hydrated lime or sulphur, and the supplementary calcium was in the form of either limestone or gypsum at rates of 100 and 200 lb. per acre.

In the first experiment (1937 to 1941) an area was used that had been under maize continuously for over 40 years, and basic fertilizer of a 4–8–8 grade was applied at the rate of 1 ton per acre. There was practically no scab during the period covered by this series of tests, except for one highly limed (pH 7) plot in 1941 (50 per cent. infection) and a subsequent crop on the same area in 1942 (100 per cent.). The disease was no doubt held in check by the initial location of the plots on an apparently scab-free soil and routine 'seed' treatment. The calcium supplements exerted no effect on crop yield or scab incidence [cf. preceding page].

For the second experiment (1942 to 1946) a site was chosen on which various crops, including potatoes, had been grown previously. The average soil reaction levels in this series of trials were pH 4·8, 5·5, and 6·1, giving average yields of 308, 305, and 281 bush. per acre, respectively. On the plots where the reaction was adjusted to pH 4·8 by sulphur applications, only slight and diminishing amounts of scab occurred. At pH 5·5, however, the annual incidence of 10 to 21 per cent. was enough to be detrimental, while at 6·1 the disease assumed an increasingly serious form, the percentages of infection in 1945 and 1946 rising to over 90. Again the calcium supplements made no difference either to yield or scab infestation.

Folsom (D.) & Bonde (R.). **Skin-spot disease on Potato tubers in Maine.**—*Plant Dis. Reptr*, 34, 7, p. 209, 1950. [Multilithed.]

After stating that the skin-spot disease (*Oospora pustulans*) appeared to be more common than usual during the spring of 1950 on stored potatoes in Maine, the author outlines briefly the results of work carried out on the disease in the British Isles comparatively recently [*R.A.M.*, 28, p. 479].

Foister (C. E.) & Wilson (A. R.). **Dry rot of Potatoes.**—*J. Minist. Agric.*, 57, 5, pp. 229–233, 1950.

It is when riddling is carried out a month or more before planting that potato dry rot (*Fusarium caeruleum*) [*R.A.M.*, 27, p. 292; 28, p. 641; 29, p. 111] may cause the most serious losses, as the tubers are then becoming very susceptible. Damage at lifting may be reduced by burning off the haulm well in advance or by adopting any other means to ensure that the skin is tough and mature, and by carefully adjusting all machinery. With home-saved tubers, riddling or any other form of grading should be deferred until a few days before planting; chemical treatment is then usually unnecessary. When it is impossible to delay riddling the tubers of susceptible early varieties should be hand-graded. Scotch and Irish 'seed' is graded before dispatch and should not be graded again upon receipt.

When two lots of Arran Pilot and one of Sharpe's Express were dusted immediately after lifting with tetrachlornitrobenzene [ibid., 28, p. 140], then clamped

in October and sent to England in December, the amounts of dry rot present in April were, respectively, 6, 2, and 4 per cent., as compared with 18, 16, and 12 per cent. in the untreated.

Tubers of susceptible varieties should be boxed on receipt and not stored in bags or clamps; this also applies to local stocks of such varieties from which the ware has been removed. Harrowings of susceptible varieties should be disposed of as soon as possible after lifting, or clamped separately. Diseased discards should not be stored.

NYLUND (R. E.) & LUTZ (J. M.). **Separation of hollow heart Potato tubers by means of size grading, specific gravity, and X-ray examination.**—*Amer. Potato J.*, 27, 6, pp. 214–22, 1950.

As potatoes containing over 5 per cent. by weight of hollow heart [*R.A.M.*, 27, p. 85] do not meet the standard for U.S. No. 1 potatoes and no method, except cutting each tuber, is available to enable a grower to separate affected from healthy tubers, experiments were conducted at the University of Minnesota to determine whether hollow-heart tubers could be graded out by size grading, flotation (specific gravity), or X-ray examination [ibid., 17, p. 702].

Irish Cobbler potatoes of the 1948 crop from the Red River Valley were graded into six size classes and six specific gravity classes (by running through salt solutions of different specific gravities). The percentage by weight of hollow heart in each size class ranged from zero in tubers under 1·5 in. in diameter to 78 for those over 3·5 in. Of 24·3 per cent. hollow heart present in the 1,146 lb. examined (3,443 tubers), 20·8 per cent. occurred in the range 2 to 3·5 in. (88 per cent. of the entire weight were in this class) and only 3·5 per cent. in larger and smaller potatoes. The hollow heart in each specific gravity class ranged from 86·1 per cent. in potatoes with 1·06 sp.g. or less to 5·3 per cent. for 1·1 sp.g. In order to reduce the incidence of hollow heart to under 5 per cent. it would be necessary to grade out all tubers of less than 1·1 sp.g., or approximately 52 per cent. of the crop.

In an X-ray examination conducted in 1944 of 1,441 tubers of Irish Cobbler, 1,625 of selection No.6.39–4–40, and 1,270 of Early Ohio all from Red River Valley, 74·6, 83·1, and 84·1 per cent. hollow heart, respectively, was detected. By this method the total hollow heart present in the 695 lb. of tubers examined was reduced from 12·9 to 2·7 per cent.

NISIKADO (Y.) & NAKAYAMA (T.). **The disinfection of Rice seeds affected by Helminthosporium oryzae, with special reference to the hot-water treatments.**—*Ber. Ōhara Inst. landw. Forsch.*, 9, 2, pp. 214–229, 2 pl., 2 graphs, 1943. [Received November, 1950.]

Rice seeds naturally infected by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: see next abstract] were subjected to treatment with various chemicals or with hot water for the control of primary outbreaks of the disease on seedlings [*R.A.M.*, 8, p. 530; 25, p. 317, *et passim*]. Mercuric chloride at concentrations up to 0·2 per cent., maximum period of immersion six hours, copper sulphate (up to 8 per cent. and 48 hours), and germisan (up to 0·5 per cent. and 24 hours) proved to be insufficiently toxic to the fungus for practical use. On the other hand, four hours' immersion in formalin at 0·4 per cent. reduced the incidence of infection from 45 to a maximum of 4 per cent. Similar results were obtained with uspulun, 12 hours' immersion at 0·5 per cent. reducing the number of diseased seedlings from 60 to 4 per cent.

In the simple hot-water treatment 5, 10, and 20 minute dips at 58° to 60° proved effective, the percentage of diseased seedlings at the former temperature being 28, 20, and 19 and at the latter 26, 19, and 15, as against 65 in the controls. Using a modified method, in which the ten-minute dip at 52° to 54° was preceded by varying

periods of pre-soaking in cold water, the best results were obtained with 12 or 24 hours, giving a reduction of infection from 24·5 to 1·5 and 0·5 per cent., respectively, without loss of germinability.

Nisikado (Y.) & Nakayama (T.). **Notes on the pathological anatomy of Rice grains affected by Helminthosporium oryzae.**—*Ber. Ōhara Inst. landw. Forsch.*, 9, 2, pp. 208–213, 5 figs., 1943. [Received November, 1950.]

Penetration of the mycelium of *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: see preceding abstract] into rice glumes is first effected through the base of the small hair surrounded by four epidermal cells [*R.A.M.*, 9, p. 556]. In many cases the invading hyphae remain dormant in the lumen of the hair, thereby giving no external indication of the presence of the fungus. From the hair the hyphae penetrate the walls of the surrounding epidermal cells and extend laterally in the same manner or by way of the protoplasmic strands. The latter further afford a ready means of ingress into the subepidermal sclerenchyma cells and the innermost parenchymatous tissue of the hulls. On the highly sensitive hull cells the discoloured lesions extend for some distance beyond the advancing hyphae. In the kernel proper, which is not reached until about a week after entry into the glumes, the mycelium appears to be invariably confined to the thin layer composed of seed coat and pericarp.

Malaguti (G.). **Algunas notas sobre las enfermedades del Arroz.** [Some notes on the diseases of Rice.]—*Agric. venez.*, 14, 140, pp. 44–46, 3 figs., 1950.

Two important rice diseases have been observed in Acarigua (Portuguesa), San Carlos (Cojedes), and Yaritagua (Yaracuy), Venezuela, where the cultivation of the crop is stated to be rapidly expanding, namely, blast (*Piricularia oryzae*) [C.M.I. map No. 51] and *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: C.M.I. map No. 92]. Among the weeds suspected as carriers of the former pathogen, *Panicum sanguinale* is widespread, while the latter has been encountered on *P. fasciculatum*, also very prevalent in the fields of Acarigua.

Van Schoonneveldt (J. C.). **Tapvlakziekten en tapvlakbehandeling.** [Tapping panel diseases and tapping panel treatment.]—*Bergcultures*, 19, 8, pp. 163, 165, 167, 169, 1950.

Much of the information in this survey of the tapping panel diseases of *Hevea* rubber, namely, stripe canker (*Phytophthora palmivora*), patch canker (*P. palmivora* and *Pythium complectens*), and mouldy rot (*Ceratostomella fimbriata*), and their control in Indonesia is based on Heubel's investigations on the subject from 1937 to 1940 [*R.A.M.*, 19, p. 726], but some up-to-date observations on fungicidal treatments may be of interest. The most effective method of direct prevention consists in the application to the entire tapping surface (which must be thoroughly dry), at regular intervals of seven to ten days throughout the rainy period, of socony product 2295A plus 3 per cent. carbolineum plantarium [ibid., 23, p. 290]. At the moment it is difficult to procure the latter component, and experiments have therefore been carried out with other vaseline-containing products, such as stanvac tree fungus cure or shell-otina-compound, with satisfactory results. The treatment of stripe canker should be carried out at intervals of four to six days. In the case of patch canker the application of the vaseline product should be preceded by scraping off the diseased tissue—if necessary right down to the wood. Mouldy rot infections are generally very virulent and refractory to treatment, necessitating the application every three to five days of a vaseline product combined with a fungicide to a strip of bast 5 cm. in breadth immediately above the tapping cut. In very severe cases a watery disinfectant, such as izal or white septol, may also be applied daily.

Gerstel (D. U.). **Is resistance to Verticillium wilt in Guayule related to chromosome number?**—*Agron. J.*, 42, 6, pp. 310–311, 1 fig., 1950.

In a guayule (*Parthenium argentatum*) planting at Stanford University, California, in 1947, wilt (*Verticillium* [*albo-atrum*: *R.A.M.*, 26, p. 147]) was found to be more severe on diploid plants with 36 chromosomes than on the polyploids in an adjacent plot. Counts made in the following year in field plantings near Salinas revealed highly significant differences between diploids, triploids, and tetraploids in reaction to the disease, resistance increasing with the chromosome number. The sole exception was strain A-1263, a triploid with resistance equal to that of the tetraploids. The mean percentages of wilt in the randomized blocks were as follows: one diploid strain (864 plants) 15·9, five triploids (1,728 of each) 1·2 to 8·5; and six tetraploids (1,728 of each) 0·8 to 3·5; among the five diploids (720 of each) in the border plots dividing the field into 24 units the incidence of infection ranged from 13·5 to 26 per cent. In a third planting of 240 plants each of one diploid, three triploids, and four tetraploids the mean wilt percentages were 23·8, 1·7 to 10, and 1·3 to 5, respectively. Similar results were obtained by Schneider with the strains represented both in his [ibid., 25, p. 139] and the present study.

Woodbridge (C. G.). **Boron in Canadian agriculture.**—*Canad. Chem. Process Industr.*, 34, 5, pp. 403–404, 406, 408, 1950.

The writer summarizes some important contributions to the subject of boron deficiency in vegetable and orchard crops in the Maritime Provinces, Quebec, Ontario, and British Columbia [cf. *R.A.M.*, 29, p. 432], and its correction by means of regular soil amendments with boron compounds. The crops mentioned in this survey are beet, cabbage, carrot, cauliflower, celery, peas, swede, apple, pear, apricot, lucerne, and cereals.

According to unpublished data by the author and H. R. McLarty, the boron content of wheat that failed to produce kernels at Kelowna, British Columbia, was only 5 p.p.m. After treatment with boric acid at the rate of 30 lb. per acre the heads developed normally and the boron content had increased to 9 p.p.m. A similar failure on the part of maize in the Okanagan Valley was rectified by the same method.

Hopf (Maria). **Untersuchungen über die natürliche Mikroflora des Bodens.** [Studies on the natural microflora of the soil.]—*Arch. Mikrobiol.*, 14, 4, pp. 661–677, 3 graphs, 1950.

Samples of a natural soil (juniper slope) examined by various methods at the University of Göttingen, Germany, yielded a lower ratio of fungi to actinomycetes than cultivated (garden and field) soils. The few species of fungi isolated from the first-named by Cholodny's slide technique included *Hormodendrum*, *Rhizopus*, and *Aspergillus*.

Williams (R. O.). **The Clove industry of the Zanzibar Protectorate. Parts I and II.**—*World Crops*, 2, 4, pp. 143–145; 5, pp. 198–200, 8 figs., 1950.

The first part of this useful survey of the Zanzibar clove industry deals with the history and general circumstances of cultivation, while the second reviews the existing situation with regard to 'sudden death' disease [*R.A.M.*, 27, p. 276; 29, p. 432].

Blattný (C.) & Osvald (C. V.). **Předběžný přehled viros Chmele a boj proti nim.** [Preliminary survey of Hop viroses and their control.]—*Ochr. Rost.*, 22, 1–2, pp. 5–28, 10 pl., 1949. [French summary.]

Up to 1947 there were ten known virus diseases of hops in Czechoslovakia and three variegations. The authors' work at the State Hop Research Station, Žatec,

in 1947 and 1948 increased the number of known diseases to 25. The various viroses are distinguished at present only by their symptoms.

'Glassy' curl (the principal disease in the 'kadeřavost' (curl) complex) [*R.A.M.*, 15, p. 396] is characterized by wavy, inwardly curled leaves, with 'glassy' greenish or yellowish interveinal tissues, which later dry up in long, dark brown stripes. The interveinal tissue is thinner than in healthy leaves so that on the lower surface the veins appear raised. The leaves are brittle and have marked indentations. Severely infected plants are yellow, have badly developed root systems, do not reach their full size, and die prematurely. The cones often do not close, yields are decreased, and both young and mature plants are more often killed by bacterioses and fusarioses than healthy plants.

The veins on the lower surface of leaves affected by 'translucent curl' are only slightly raised, inward curling is slight or absent, and the interveinal tissues are paler green and translucent. The symptoms are more apparent on lateral shoots than on the bine leaves, the reverse being true of 'glassy' curl. The plants reach their full size and the death rate is lower than with 'glassy' curl. Often both viroses appear simultaneously on the same plant; both may occur on single plants in small groups, from which they spread, or entire gardens may be infected.

In 'leaf necrosis' of virus origin the tissues between the small veins turn yellow at first, later brown and rusty. The main veins remain green. The leaves are only slightly waved and curled. The stem leaves are usually more affected than side-shoots. Death rate is negligible.

In 'leaf holing', the young leaves develop pale green spots along the main veins, the tissue of which later tears. The upper leaves are mostly affected. These four viruses or virus components make up the 'kadeřavost' complex, which is one of the most serious in Czechoslovakia. It is possibly identical with, or related to hop nettlehead virus [ibid., 28, pp. 308, 309].

Leaves affected by 'variegated mosaic' bear along the veins whitish, or yellowish to pale green spots with pronounced margins, the tissue of which later dries. Few cones are formed and severely affected plants are stunted; there is high mortality. The destruction of badly diseased plants in several gardens has eradicated the disease.

'Ornamental mosaic' affects mostly the lower part of the bine, especially the side-shoots, appearing as yellow to orange patterns of various shapes with marked outlines, which later disappear or become necrotic. The leaves are slightly waved. The disease is fairly widespread and occurs frequently with the infectious sterility complex [ibid., 15, p. 396], rarely alone.

'False ornamental mosaic' consists of small, yellowish or greenish, coalescing spots, forming indefinite patterns. The disease occurs rarely in Bohemia (more frequently in Moravia) and seldom alone, sometimes in association with the infectious sterility complex, the curl complex, or leaf asymmetry.

In 'speckled mosaic' the lower leaves exhibit small, pale green or yellow spots, which turn brown or disappear. The symptoms often occur independently and without an appreciable effect on yield.

'Fuggles mosaic', similar to, but probably not identical with that reported from England (hop mosaic virus) [ibid., 27, p. 295; 28, p. 241], was reported from only one garden, which does not exist any longer. The dwarfed leaves showed conspicuous pale to orange yellow mottling, the lower leaves were curled backwards and the margins of the upper ones often curled inwards. Flowers were scarce or absent and the cones small and badly closed. The disease was transmitted by grafting and by sap inoculation, but not by soil. The plants died when six to ten years old. Incidence was more severe in wet, cool years.

'Yellow-spotted mosaic' occurs mostly in combination with various forms of 'leaf deformation' (infectious sterility complex). Pale green or yellowish spots appear mostly on the leaf margins and on the side-shoots.

'Virus chlorosis' is probably not identical with hop chlorotic disease (*Humulus* virus 3) [ibid., 27, p. 42]. The whole leaf including the veins is yellowish, the apical leaves being brightest yellow; they often curl upwards, are under-developed, and turn brown and dry, starting at the margins. The plants are dwarfed and often sterile.

'Warped leaves' occur mostly on plants with prematurely formed heads, which give only low or no yields. On the lower leaf surfaces a section of the main vein dies, but the continuation is healthy, with the result that the lobes twist backwards. All, some, or only single leaves of a plant may be affected. The disease is associated with virus chlorosis, and more often with the various forms of mosaic, and 'undivided' leaves.

Six types of disease symptom are associated with the 'infectious sterility complex', 'typical leaf deformation' being the main virosis in this complex. The often darker, convex leaves curl backwards, have short, crooked petioles, and adhere closely to the bine. Lobes overlap and are sometimes paler than in healthy plants, and vein junctions on the lower surface are often raised and whitish. The last internodes may be shortened, the plants usually do not reach the top of the framework, and either do not flower, or produce small cones which close badly. The tips of the bines and side-shoots frequently die (? an independent complex), or often remain as buds. 'Vigorous leaf deformation', another less frequent type, is characterized by symptoms similar to those of the typical leaf deformation, except that the side-shoots do not remain in the bud state or die. The plants are vigorous.

Four types of virosis, together or in part, form a special complex (virus blanching), nearly related to infectious sterility. 'Virus blanching' reported from a few gardens only, causes the indentation of the margin to be very sharp, parts of the lamina are whitish to white, and areas near the petiole green; the leaves are convex and curled backwards. The main veins are raised on the lower surface. The plants are mostly sterile, and do not reach the top of the framework. The mortality rate is high. Crinkled and swollen leaves are similar in shape to those of the previous type, without the whitening symptoms. Symptoms are often accompanied by leaf lobing, rarely by 'kadeřavost'.

Other diseases described are 'climbing disease', 'net necrosis', 'pernicious (lethal) virus', and certain rare variegations and chloroses.

Identical or related viruses occur in nettles; *Urtica dioica* is known to harbour many of them, *U. urens* only a few. Limited transmission experiments showed that juice from hop plants affected with 'kadeřavost' transmitted the disease to young *U. urens*, causing dwarfing; 'glassy curl' was sap-transmitted to older *U. urens* plants, causing dwarfing and changes in leaf shape; sap from *U. dioica*, showing virus symptoms (narrowing of leaves, sharp indentation, and mosaic) caused lobing, entire margins, and chlorosis in the hop; and juice from *U. dioica*, affected by another virus disease, induced leaf-holing in hops.

Hop viruses are transmitted by cuttings. In the case of 'kadeřavost' the symptoms in young plants can be slight or latent, and may appear after a number of years. Juice on the knife also transmits most of the diseases, except warped leaves and virus chlorosis.

In a few cases *Chlorita flavescens* was found to transmit 'kadeřavost'; *Psylliodes attenuata* is also a suspected vector. The 'kadeřavost' complex, the infectious sterility complex, virus chlorosis, and some mosaics were transmitted by grafting. Infection is introduced into the gardens mainly through diseased planting material.

The viruses of the 'kadeřavost' complex remain viable in the soil for up to six years, those of the infectious sterility complex, warped leaves, ornamental mosaic, and leaf-holing for one to two years. The viruses of 'variegated' mosaic, and virus chlorosis do not persist in the soil.

Control measures include disinfection of knives, insect control, elimination of

nettles in the vicinity of gardens, proper cultural and sanitary measures, the use of new or disinfected poles, and serological examination for latent infections. Diseased plants should be replaced by healthy material. A programme is in progress in which 7,000 ha. of gardens will be re-stocked within 10 years with new, healthy stocks.

Blattný (C.) & Osvald (C. [V.]). **Zpráva o zdravotním stavu Chmele v roce 1948.** [Report on the health of Hops in the year 1948.]—*Ochr. Rost.*, 22, 3–4, pp. 152–153, 1949.

It is stated in this report that downy mildew of hops (*Pseudoperonospora humuli*) was practically absent in Czechoslovakia [*R.A.M.*, 13, p. 396] in the extremely dry year of 1947, but a slight attack developed in the spring of 1948. Virus diseases [see preceding abstract] increased greatly and caused yield losses of at least 10 per cent.

Castellani (E.). **L'avvizzimento del Sesamo.** [Wilt of Sesame.]—Reprinted from *Olearia*, *1950*, 1–2, 14 pp., 7 figs., 1950. [French and English summaries.]

In the summer of 1947 sesame plants growing at Florence developed a wilt and tracheomycosis. The bottom leaves turned yellow, drooped, and withered, then the leaves above became affected, and the top of the stem dried up and bent over. A brown discoloration was present in the wood and extended from the roots to (in some cases) the apex. A strain of *Fusarium oxysporum* [cf. *R.A.M.*, 24, p. 503; 25, p. 255] present in infected material was demonstrated by inoculation experiments to be specific to sesame and is therefore regarded as a new form, *F. oxysporum* f. *sesami*. Artificial infection experiments showed that the most severe attacks occurred in sterilized soil and that the organism is carried on and in seed from diseased plants and lives on in the soil in the remains of infected plants. Control consists in the use of clean seed and resistant varieties. In one preliminary test the variety Venezuela 25 showed marked resistance.

Report of the Hawaiian Sugar Experiment Station, 1949.—*Printed Reps. Hawaii. Sug. Pl. Ass.*, *1949*, 49 pp., 38 figs., 11 graphs, 1 diag., 2 maps, 1949.

In the section of this report dealing with diseases of sugar-cane in Hawaii (pp. 15–17) [cf. *R.A.M.*, 27, p. 494] it is stated that of the major local diseases only leaf scald [*Xanthomonas albilineans*] and chlorotic streak were important. It was recommended that to control leaf scald, seen on the susceptible variety 28–4291, only healthy planting material should be used. Studies on the cause and transmission of chlorotic streak have shown the presence of X-bodies, or viroplasts, in leaf cells of affected cane plants and indicated the transmission of the disease by direct root contact in water culture solutions and in soil. Diseased plants which did not show leaf symptoms were stunted with stalks of small diameter.

Of the 178 cane varieties tested at the Samoan Substation 98 have contracted Fiji disease. Two years after planting, 37–1933 contracted the disease in March, 1949, in Samoa, and earlier cases were reported from the Philippines. Trials are being made to transmit the disease mechanically.

In laboratory tests pyridylmercuric acetate ($\frac{1}{2}$ to 1 oz. per gal.) was a highly effective protectant of cuttings planted in soil heavily infected with the pineapple disease organism (*Ceratostomella paradoxa*) [cf. ibid., 29, pp. 230, 332] but was of less value against other organisms. Semesan was the most promising fungicide against *Pythium* root rot [*Pythium* spp: ibid., 27, p. 96] in 1949. Thiosan and phygon were slightly less effective.

A bacterium that proved pathogenic on both the red and white varieties of cactus (*Opuntia megacantha*) has been isolated. The organism may be successfully used in the cactus eradication programme being used at Parker Ranch, Hawaii.

Hopkins (J. C. F.). **A descriptive list of plant diseases in Southern Rhodesia and list of bacteria and fungi.**—*Mem. Dep. Agric. S. Rhod.* 2, 106 pp., 1950.

This revision of the annotated list of plant diseases in Southern Rhodesia published in 1939 [*R.A.M.*, 21, p. 213] incorporates and brings up to date previous lists [ibid., 22, p. 396]. A list of the botanical equivalents of common host names has been added and the common name (when known) is also given after the botanical name in the text. The publication concludes with a taxonomic list of bacteria and fungi and their hosts.

Wallace (G. B.) & Wallace (Maud M.). **Tanganyika fungus list : recent records No. XIII.**—*Mycol. Circ. Dep. Agric. Tanganyika*, 26, 8 pp., 1950. [Mimeographed.]

Further fungus records for Tanganyika [*R.A.M.*, 29, p. 145] are noted. In a crop of French beans [*Phaseolus vulgaris*] almost every pod was affected by *Colletotrichum lindemuthianum* [ibid., 27, p. 158], while the same plants were also infected by mosaic [virus] and halo blight [*Pseudomonas medicaginis* var. [f. sp.] *phaseolicola*]. Runner beans [*P. multiflorus*] were affected by rust (*Uromyces appendiculatus*) [cf. ibid., 25, p. 154] and *Cercospora cruenta* [cf. ibid., 18, p. 505].

On a few farms *Pelargonium capitatum* plants grown for oil were destroyed by *Armillaria mellea* [cf. ibid., 25, p. 446] and *Helicobasidium purpureum*. The former killed the roots, though it is not yet known whether the latter did so in all cases. In the *A. mellea* root rot a layer of white mycelium was present under the bark, which sometimes split longitudinally; in the violet root rot a distinct violet colour was present in the thin layer of external mycelium. Only the *Rhizoctonia crocorum* state was present.

Rugose mosaic [virus Y] was found on potatoes on a farm in the Southern Highlands Province. Mild mosaic virus [virus X: ibid., 23, p. 275] is moderately common in all areas; leaf roll virus [ibid., 28, p. 246] is known only in the Usambaras and Uluguru Mountains, with one restricted outbreak from introduced tubers in the Southern Highlands Province.

Pyrethrum [*Chrysanthemum cinerariaefolium*] bud rot (*Ramularia bellunensis*) [ibid., 28, p. 444], previously found in the Southern Highlands Province, is now present in the Northern Province.

Strawberry mild crinkle virus [cf. ibid., 29, p. 160] recently occurred in the Southern Highlands Province, where leaf blotch (*Dendrophoma obscurans*) [cf. ibid., 29, p. 81] was also observed. Sunflower leaf spot (*Septoria helianthi*) [cf. ibid., 28, p. 401; 29, p. 56] was found in the south. As it occurs early in the season it can be more damaging than rust [*Puccinia helianthi*]. As spraying would not be economic, rotations are advised, with the destruction of plant remains. Mildew (*Leveillula taurica*) [cf. ibid., 29, p. 154 *et passim*] was present on leaves of a garden variety of sunflower.

Tobacco leaf curl and mosaic viruses continued to cause considerable loss, and intense outbreaks occurred in the Southern Highlands Province. Only active measures can eliminate these diseases.

Kromnek (tomato spotted wilt [virus]) [ibid., 27, p. 163] was much worse by the end of March than ever before. Considerable loss in tobacco seed-beds was incurred through damping-off (*Rhizoctonia* [*Corticium*] *solani*). Tomatoes near Moshi showed magnesium deficiency [cf. ibid., 27, pp. 49, 341].

Kuhnholtz-Lordat (G.) & Barry (J. P.). **Quelques micromycètes parasites intéressants du sud de la France.** [Some interesting parasitic micro-fungi from the south of France.]—*Bull. Soc. mycol. Fr.*, 65, 3–4, pp. 121–131, 8 figs., 1949 (published 1950).

This annotated list of some interesting fungi collected in the south of France

[cf. *R.A.M.*, 26, p. 328], includes *Herpotrichia ephedrae* n.sp. on *Ephedra distachya*, perithecia of which measured up to 115 μ in diameter, the asci 65 to 80 by 13 to 15 μ and the brown, triseptate ascospores 15 to 18 by 7 to 8 μ; *Colletotrichum iridis* n.sp. on *Iris spuria* subsp. *maritima* with hyaline conidia measuring 20 to 29 by 3 to 4 μ; *Coniothyrium chimonanthi* n.sp. on *Chimonanthus fragrans*, the pycnidia of which measured up to 130 μ and the brown spores 5 to 6·5 by 2·5 to 3 μ; and *Puccinia coronata* on *Brachypodium sylvaticum*; *Septoria anaxeoides* n.sp. on *Prunus cerasus* has sinuous conidia with the same dimensions as *S. anaxea* on *Senecio* (45 to 75 by 2·5 to 4 μ), but they differ in having 4 to 6 well-defined septa. The perithecia [pycnidia] measured up to 120 μ in diameter. Seven other new species are described.

Moesz (G.). **A Kárpát-medence üszöggombai.** [The smut fungi of the Carpathian basin.]—256 pp., 102 figs., Budapest, Egyetimi Könyvkiadó, 1950. [French summary.]

This is a well-illustrated, annotated list of Ustilaginales of the Carpathian basin, Hungary. A host index and a bibliography of 155 titles are appended.

Nehira (T.). **Taxonomic studies of the genus Aspergillus (4). The white-spored Aspergillus in the Orient.**—*J. Jap. Bot.*, 23, 3–4, pp. 51–54, 1949. [Japanese. Received November, 1950.]

In a further paper in this series [cf. 30, p. 2] notes are given on the morphology, taxonomy, and antibiotic properties of the white-spored species of *Aspergillus* found in the Far East. All are regarded as forms of *A. candidus*.

Sprague (R.) & Johnson (A. G.). **Ascochyta leaf spots of cereals and grasses in the United States.**—*Mycologia*, 42, 4, pp. 523–553, 2 figs., 1950.

After a critical discussion of the genus *Ascochyta* the authors give full descriptive notes on leaf spots of numerous grasses and cereals caused by species of *Ascochyta* in the United States and a key to their identification, including *A. sorghi* (syn. *A. graminicola*) [*R.A.M.*, 27, p. 349], *A. phleina* [ibid., 27, p. 528] on *Phleum pratense*, *A. desmazieri* on *Lolium* spp., *A. graminea* n.comb. (syn. *Diplodia graminea*) on *Cynodon dactylon* [ibid., 15, p. 102], *A. brachypodii* (Sydow) n.comb. on many hosts, including oats, *A. sorghina* [ibid., 18, p. 517] on sorghum, *A. hordei* on various hosts, including winter barley, *A. avenae* on red oats (*Avena byzantina*), and two new species. A bibliography of 63 titles is appended.

Møller (F. H.). **Danish Psalliota species. Preliminary studies for a monograph of the Danish Psalliotae.**—*Friesia*, 4, 1–2, pp. 1–60, 17 pl. (4 col.), 14 figs., 1950.

In this critically annotated list of Danish species of *Psalliota* of the *Rubescentes* group, based on observations of the last 30 years, are 11 new species, 11 new varieties, one new form, one new name, and one new combination. Keys to the sub-groups and species are provided. *P. campestris* is used in Lange's restricted sense [*R.A.M.*, 21, p. 429] and five varieties (four new) and one new form are recognized.

Blister blight in Ceylon.—*Plant. Chron.*, 45, 10, pp. 261–264, 1950.

In an address to the Standing Committee for Agency Affairs [Southern India], Dr. R. V. Norris, Director of the Tea Research Institute of Ceylon, stated that in a preliminary trial for the control of blister blight [*Exobasidium vexans*: *R.A.M.*, 29, pp. 176, 585], carried out with a Four Oaks central charged battery spraying set, eight men treated a 6-acre block of pruned tea in 4½ hours using 52 gals. spray at a total cost of Rs. 2·44 per acre. In reviewing the nature and course of the disease [J.] Lamb reports that usually the spore germ-tube can only penetrate leaves or stems up to 30 days old. The fungus causes translucent spots to appear

on the leaf 6 to 10 days later. The disease carries over through drought periods on new growth inside the bushes, where the microclimatic conditions enable the fungus to survive [ibid., 29, p. 538].

MAYNE (W. W.). **Blister blight in the High Range.**—*Plant. Chron.*, 43, 1, pp. 12–16, 1 graph, 1948. [Received May, 1950.]

In an attempt to obtain a rough numerical estimate of the severity of blister blight [*Exobasidium vexans*] in 1947 in South India, weekly reports received from 38 tea estates in the High Range [cf. *R.A.M.*, 27, p. 298] were assigned a figure in the range 1 to 8 suitable for graphic expression. The highest rating was used when reports indicated almost complete destruction of young buds and cessation or reduction of plucking from lack of flush. When some recovery was indicated lower ratings were employed, although crop losses may have continued. The reporting estates were divided into four random groups and a graph prepared for each group. A graph of the combined data indicated a general decline in incidence from mid-February to mid-April; a sharp increase from mid-April reaching a peak in the fourth week and then declining; a slight but definite decline until the end of the third week in May; a very sharp increase from the fourth week of May until the end of July; a decline in August; a slight recrudescence about mid-September and a slight decline during the rest of the month; a very sharp and severe increase beginning towards the end of the first week of October and reaching a peak about the third week, reported to be as severe as the July outbreak; and a marked decline in disease activity and recovery of growth throughout November. The increases in disease in February, mid-April and at the beginning of June, 1947, were each preceded by two or more consecutive days' rainfall. From the end of May onwards rainfall ceased to be a limiting factor. In August the crop harvested was only about 40 per cent. of the average August crop of the preceding five years.

In 1948 the disease reached a low level in mid-August and the recovery growth remained comparatively free from infection for some time. The very dull, wet weather in late August and the whole of September slowed down growth considerably, permitting the disease to catch up with growth before much of it was harvestable.

The lower elevation estates and those where temperatures tend to be high recover more quickly than higher and cooler estates in the High Range.

The development of severe attacks requires a substantial supply of susceptible tissues and favourable conditions [see preceding abstract] for infection, for active and abundant spore production, for spore distribution, and for the initiation of infection. A severe attack may fail to develop in the absence of any one of these requirements.

VAN EMDEN (J. H.) & REITSMA (J.). **Verslag van een studiereis naar Ceylon en Zuïd-Indië, teneinde de blister-blight-ziekte van de Thee te bestuderen.** [Report of a study tour in Ceylon and South India to investigate the Tea blister blight disease.]—*Arch. Theecult.*, 17, 1, pp. 5–70, 41 figs., 2 graphs, 2 maps, 1950. [English summary.]

At the invitation of the Tea Research Institute of Ceylon the authors represented the Central Experiment Stations Association (Java) at the symposium on blister blight (*Exobasidium vexans*) held at Nuwara Eliya on 11th November, 1949, and gave the following report on the effects produced by the disease during the three years of its occurrence in Ceylon and South India [*R.A.M.*, 29, pp. 385, 585 and preceding and next abstracts].

The damage caused by blister blight in Ceylon appears, in general, to be slighter than in Sumatra [ibid., 29, p. 538], the reasons being the lower humidity of the microclimate in the former country due to less shade, clean weeding, and smaller bushes; the lower susceptibility of the types of tea grown in Ceylon, consisting

largely of the comparatively resistant Chinese hybrids; and the lower prevailing temperatures, resulting in slower growth of the pathogen. Nevertheless, the common estimate of a 10 per cent. reduction of the Ceylon crop is regarded as unduly low for the 'blister blight areas', though it may represent the situation on the island as a whole. Compensation for the loss of crop is afforded by such practices as reduction of shade, increased manuring, and destruction of the apical buds, which stimulates the formation of several lower buds on the same twig. The response to this stimulus, however, will probably be of brief duration, since the new growth is produced at the expense of the carbohydrate reserves.

Good results have been obtained in experiments at St. Coombs by weekly or fortnightly applications to fields recovering from pruning of 0·25 per cent. copper oxide (90 l. per ha.), using pressure-retaining knapsack sprayers furnished with extra fine nozzles. In the authors' opinion, a good many fields will have to be sprayed to maintain them at a reasonable level of productivity.

Notes are given on the occurrence in Ceylon tea gardens of phloem necrosis [ibid., 27, p. 339], brick-red root rot (*Poria hypolateritia*) [ibid., 28, p. 490], scab (*Elsinoe*) [*theae*: ibid., 20, p. 599], and *Cylindrocladium* (?) *scoparium* [cf. ibid., 23, p. 135; 28, pp. 22, 527]. The last-named infects the roots of bushes deprived of their starch reserves through repeated attacks of blister blight. Inoculation experiments were successful on both intact and wounded roots.

In South India the blister blight situation bears a considerable resemblance to that prevailing in Indonesia. In general, a correlation was observed between shade reduction and control of the disease, while other practices tending to minimize the risk of infection are slope pruning and plucking and the maintenance of a smooth plucking table.

Reitsma (J.) & Van Emden (J. H.). **De bladgallenziekte van de Thee in Indonesië.** [The leaf gall disease of Tea in Indonesia.]—*Arch. Theecult.*, 17, 1, pp. 71–76, 1950. [English summary.]

A fuller version of the authors' observations on the first outbreak of tea blister blight (*Exobasidium vexans*) [see preceding and next abstracts] in Sumatra has already been noticed from another source [*R.A.M.*, 29, p. 58].

Prillwitz (P. M. H. H.). **Overzicht van de organisatorische maatregelen, genomen ter voorkoming van uitbreiding naar andere gebieden en der bestrijding der blisterblight ziekte van Thee.** [Survey of the organizational measures adopted for the prevention of spread to other regions and for the control of blister blight disease of Tea.]—*Arch. Theecult.*, 17, 1, pp. 1–3, 1950.

In May, 1949, the Indonesian Government prohibited the export of tea and other living plant material from the Negara–Sumatra–Timor region to other parts of the country with a view to the prevention of blister blight [*Exobasidium vexans*] dissemination [*R.A.M.*, 29, p. 538 and preceding abstracts]. In the following September an advisory committee was set up to contrive measures for the study, prevention, and control of the disease, and to decide on the method whereby the interested parties should contribute to the necessary financial outlay. The Committee's report, published in November, 1949, urgently recommended (*a*) the undertaking, at the earliest possible date, of a fundamental study on the life-history and mode of dissemination of the fungus and on the influence of climate, microclimate, and other factors on its rate of spread, and the intensity of attack on the tea bushes, together with a search for the most expedient indirect and direct control measures; (*b*) a further investigation of the method of combating the disease outside Indonesia; (*c*) general diffusion among Java tea-planters, including native garden-owners, of knowledge of the symptoms of blister blight, so that an eventual outbreak may be promptly notified; and (*d*) the preparation of plans for the

prompt execution of an intensive control campaign as soon as the disease is detected in Java.

The Committee further recommended the appointment for a limited period of a specialist, with the necessary assistants, to implement these proposals under the supervision of the directors of the Experiment Station of the Central Experiment Stations Association, the General Agricultural Experiment Station at Buitenzorg, and the General Experiment Station of A.V.R.O.S. at Medan (Sumatra). The costs involved in the research, including visits to study conditions abroad, should be borne by a special 'Blister blight fund', while those of propaganda among the planters and of the provision of control equipment and chemicals should fall on the Central Experiment Stations Association and the General Agricultural Experiment Station, this being specifically a concern of Java. It was estimated that a sum of Fl. 135,000 would be required by the Fund in 1950, for which purpose the contributions were reckoned at 50 cents per 100 kg. dry tea. In 1951, however, the necessary outlay would probably be considerably smaller.

Gendron (Y.). **Action des produits du métabolisme d'un champignon sur la multiplication du virus de la mosaïque du Tabac et du virus X chez le Tabac.** [Action of the products of metabolism of a fungus on the multiplication of the Tobacco mosaic virus and virus X in Tobacco.]—*C.R. Acad. Sci., Paris*, 230, 21, pp. 1890–1891, 1950.

Experimental evidence is presented to demonstrate the temporary inhibition, by filtrates of three- to five-week-old cultures on potato broth, of *Rhacodiella castaneae* (the conidial state of *Sclerotinia pseudotuberosa* [or *Ciboria batschiana*: *R.A.M.*, 28, p. 547]), of the multiplication of the tobacco mosaic virus and potato virus X in Samsun tobacco plants. In Maréchal Joffre tomatoes and more especially White Burley tobacco the viruses proved less susceptible to the secretions of the fungus, which were therefore presumed to act on the host rather than on the virus. This hypothesis was confirmed by an inoculation test on *Datura* [*stramonium*] leaves with an equal mixture of a culture filtrate of *S. pseudotuberosa* and tobacco mosaic virus, which resulted in the production of a normal quantity of local lesions.

Ciferri (R.). **Malattie ed alterazioni riscontrate nelle coltivazioni di Tabacco del Compartimento di Verona nell' annata 1949.** [Diseases and abnormalities found in the Tobacco plantations of the Division of Verona during the year 1949.]—*Tabacco*, 53, 605, pp. 364–384, 21 figs., 1949.

During 1949 all tobacco varieties grown in the Division of Verona were affected by mosaic. The disease was particularly severe near Cerea on Kentucky, 95 to 100 per cent. infection occurring in one plantation. The form of mosaic present almost everywhere was ordinary tobacco mosaic virus [*R.A.M.*, 27, p. 201], but other strains, including Johnson's 2 and 3 [? strain of cucumber mosaic virus], were present sporadically. Ring spot virus [loc. cit.; ibid., 28, pp. 492, 506] was present almost everywhere and on all varieties. In most plantations, however, the percentage of plants affected was very low or even negligible, but at Rovigo and to a less extent in the Trento and Udine area, 30 to 40 per cent. of the plants were affected. Apart from the typical ring marking, the most characteristic symptom locally was oak-leaf spot.

Wildfire (*Bacterium* [*Pseudomonas*] *tabacum*) [ibid., 29, p. 482] was found in the whole area comprised by Verona, Rovereto, Trento, Carpanè, Bassano, Vicenza, and Cerea on every variety grown, particularly Kentucky, Resistente, and Nostrano del Brenta. The growers stated that the disease had been present for several years, the amount of damage caused depending on the weather conditions.

Potassium deficiency [ibid., 27, p. 201; 29, p. 61] was rather common on Bright

tobacco near Udine and was occasionally found on Resistente 142 in the Trento area.

Tobacco near Rovigo rather commonly showed symptoms resembling those caused by *Bact.* [*Xanthomonas*] *solanacearum* [ibid., 27, pp. 264, 390; 28, p. 163], but cultural studies gave negative results.

Sclerotinia disease (*S. libertiana*) [*S. sclerotiorum*: ibid., 26, p. 422; 28, p. 424] was reported in some partly harvested fields of Bright tobacco near Udine.

Koch (L. W.) & Stover (R. H.). **Recent field tests on the effect of soil fumigants upon brown rootrot of Tobacco in Ontario.**—*Sci. Agric.*, 30, 6, pp. 256–260, 1 pl., 1950.

In an experiment carried out at Harrow, Ontario, six soil fumigants were applied ten days prior to planting to a plot with a record of tobacco brown root rot [*R.A.M.*, 29, p. 458] and which had previously carried a heavy crop of maize, particularly conducive to subsequent brown root [ibid., 29, p. 437]. Dow N (dichloropropylene-dichloropropane), chloropicrin, and dow W40 (ethylene dibromide) [cf. ibid., 29, p. 269] all at 6 ml. per 8-in. centre (30 gals. per acre) gave greatly increased growth of the susceptible variety Harrow Velvet and reduced brown root rot (average figures for five replicates) to 9, 5, and 20 per cent., respectively, compared with 92 per cent. in untreated rows of the susceptible variety and 31 per cent. in the resistant variety Green Briar. They appear to offer, therefore, particular promise for the control of this condition.

Gäumann (E.) & Jaag (O.). **Über das toxigene und das physikalisch induzierte Welken.** [On toxigenically and physically induced wilting.]—*Phytopath. Z.*, 16, 2, pp. 226–256, 2 figs., 7 graphs, 1950.

The authors confirmed the observations of Hodgson and collaborators as to the toxicity of glucosans to tomato leaflets [*R.A.M.*, 26, p. 443; 28, p. 363]. With regard to the localization and expression of the tomato wilting effect, the irreversibility of the condition, and the minimal toxic concentration, the glucosan-induced (physical) wilting corresponds to a great extent with that of toxigenic origin. The two pathological states differ, however, in (1) the pathological course of the water metabolism (the shock effect and ensuing transient enhancement of transpiration); (2) the mechanism of operation of the pathogenic agency: the points of attack are totally diverse, the wilt toxins acting on the plasma and disturbing the osmotic premises of turgor, whereas the glucosans clearly affect mainly the cell walls, obstructing the submicroscopic capillaries and thereby interrupting the water circulation; (3) the *dosis minima* for the irreversible injury of the three lowest leaves, which is some 80 to 100 times higher for inulin than for lycomarasmin, the toxic principle of tomato wilt (*Fusarium* [*bulbigenum* var.] *lycopersici*) [see next abstract], the values for pure lycomarasmin, lycomarasmin plus iron, and inulin being 150 to 200, 10 to 15, and 1,600 to 1,700 mg. per kg. live weight; (4) the host spectrum of lycomarasmin is restricted, only potato, *Pelargonium zonale*, and vine (besides tomato) having proved sensitive to the toxin in the experiments herein described, whereas the plants irretrievably damaged by the absorption of glucosans included *P. zonale*, vine, turnip, cotton, *Impatiens holstii*, lupin, tobacco, bean (*Phaseolus vulgaris*), and pea.

The simultaneous application of lycomarasmin and inulin did not produce any new effect but merely an enhancement of the independent action of each component.

Gäumann (E.), Naef-Roth (Stephi), & Mescher (G.). **Untersuchungen über das Lycomarasmin.** [Studies on lycomarasmin.]—*Phytopath. Z.*, 16, 3, pp. 257–288, 1 diag., 3 graphs, 1950.

A method is described for the biological assay of tomato wilt (*Fusarium* [*bul-*

bigenum var.] *lycopersici*) toxins. In two strains of the fungus studied in detail there was no connexion between toxigenicity *in vitro* and pathogenicity *in vivo*, the strain which was highly virulent in nature forming only a small quantity of wilt toxin in culture, while the naturally almost non-pathogenic strain produced a large amount *in vitro*.

The *doses minimae* for pure lycomarasmin [*R.A.M.*, 29, p. 540 and preceding abstract] at concentrations of $10^{-2.5}$ and 10^{-4} mol. are approximately 150 and 50 mg., respectively, per kg. live weight. Within the plant lycomarasmin probably forms with the free or unbound iron a lycomarasmin-iron complex which is about ten times more toxic than pure lycomarasmin, and has, moreover, a considerably wider host range, comprising (in addition to tomato) *Pelargonium zonale*, vine, cotton, pea, turnip, *Ricinus communis*, lupin, *Impatiens holstii*, and tobacco (only a few leaves spotted).

No connexion could be established between susceptibility to the wilt pathogen on the one hand and to lycomarasmin on the other among the varieties Bonny Best (very susceptible), Pan America, Marglobe, and Rutgers (moderately susceptible), and the highly resistant Red Currant (*Lycopersicon pinpinellifolium*), all of which were equally sensitive to the influence of the toxin. The observed differences in varietal susceptibility to wilt must rest, therefore, on disparities in the degree of resistance to the systemic spread of the fungus. Within the limits of experimental error, differences in the nutrition of the tomato plants did not appear to affect their susceptibility to lycomarasmin.

MacGillivray (J. H.), Michelbacher (A. E.), & Scott (C. E.). **Tomato production in California.**—*Circ. Calif. agric. Ext. Serv.* 167, 60 pp., 49 figs., 1 graph, 1950.

In a section of this circular (pp. 35–48) notes are given on the symptoms and control of the principal tomato diseases in California [*R.A.M.*, 29, p. 586].

Holmes (F. O.). **Internal-browning disease of Tomato caused by strains of Tobacco-mosaic virus from Plantago.**—*Phytopathology*, 40, 5, pp. 487–492, 1950.

The evidence presented in this paper for the etiological connexion of *Plantago* strains of tobacco mosaic virus with internal browning of tomato in New Jersey has already been noticed from another source [*R.A.M.*, 29, p. 64].

Pinto-Lopes (J.). **Wood-rotting polypores of standing trees in Portugal.**—*Bol. Soc. broteriana*, Sér. 2, 23, pp. 219–223, 1949.

This is a list, arranged in alphabetical order of the hosts, of the wood-rotting Polyporaceae collected during recent years on standing trees in Portugal [cf. *R.A.M.*, 24, p. 291]. The most important species are *Xanthocrous* [*Fomes*] *pini* and *Phaeolus* [*Polyporus*] *schweinitzii* on pine, *Phellinus* [*Panus*] *torulosus* and *X.* [*Polyporus*] *hispidus* [ibid., 21, p. 396; 25, p. 87] on many kinds of broad-leaved trees, and *Phellinus* [*F. pomaceus* var.] *fulvus* on fruit trees.

The very rare species *Hexagonia* [*Poria*] *nitida* has been found only on *Quercus ilex* and *Arbutus unedo* near Lisbon; *Ungulina betulina* [*Polyporus betulinus*: ibid., 24, p. 393 *et passim*], also exceptional in Portugal, occurs on birch in the north; *Fistulina hepatica* [ibid., 21, p. 396] is prevalent, e.g., on chestnut, *Eucalyptus* spp., *Platanus* spp., and oaks in certain areas; and *U. fomentaria* [*F. fomentarius*: ibid., 24, p. 211; 25, p. 87] is fairly widespread on alder, *Eucalyptus* spp., mulberry, pine, poplar, *Prunus* spp., oaks, *Salix* spp., and elms.

Mathiesen (A.). **Almsjukan påträffad i Sverige.** [Elm disease discovered in Sweden.]—*Skogsägaren*, 26, 4, pp. 72–75, 5 figs., 1950.

Ceratostomella ulmi has recently been isolated from diseased elms in the Zoological Garden, Stockholm, this being the first definite record of its occurrence in

Scandinavia [but see C.M.I. map No. 36: Peace (*R.A.M.*, 12, p. 334) p. 125]. The fungus was associated with the elm bark beetles, *Scolytus laevis* and *S. triarmatus*, the overwintered larvae of which were found to be heavily contaminated by spores. Some of the trees had died during the winter of 1949 to 1950, while in others only isolated branches were attacked. In some of the felled stems the brown discoloration was already apparent in the 1948 sapwood.

Essential information on the history, symptomatology, etiology, mode of infection, and geographical distribution of the pathogen is summarized. An Order prohibiting the importation into Sweden of living elm material, with a view to the exclusion of *C. ulmi*, has been in force since 1931 [ibid., 10, p. 816].

Went (Johanna C.). **Verslag van de onderzoekingen over de Iepenziekte en andere boomziekten, uitgevoerd op het Phytopathologisch Laboratorium 'Willie Commelin Scholten' te Baarn in 1949.** [Report of the investigations on the Elm disease and other tree diseases carried out at the Phytopathological Laboratory 'Willie Commelin Scholten', Baarn, during 1949.]—*Meded. Inst. toegep. biol. Onderz. Nat.* 45, 12 pp., 1950. [English summary.]

The percentage of 'Bea Schwarz' (*Ulmus carpinifolia* No. 62) contracting infection by *Ceratostomella ulmi* (excluding ten slightly attacked) in inoculation experiments in 1949 was 10·4, compared with 12·3 in 1948 [*R.A.M.*, 28, p. 428]. A number of grafts of *U. hollandica vegeta* × *U. carpinifolia* No. 1 (No. 139) developed severe infection, in consequence of which the supply of this hybrid to growers will be discontinued. *U. h. vegeta* × *U. carpinifolia* No. 28 (No. 148) is very resistant to *C. ulmi* and makes excellent growth, but the number of grafts for testing must be increased before dependable results can be obtained. When Nos. 62, 125, 132, 139, and 148 were inoculated with *Nectria cinnabarina* [ibid., 28, p. 429], only 132 and 139 contracted infection on one out of 10 branches.

A species of *Leptothyrium* was again isolated from brown spruce needles [loc. cit.]. Young as well as old needles were attacked during 1949, when the incidence of the disease increased greatly. Inoculation experiments were unsuccessful. A disease of American oaks (*Quercus borealis*) at Deurne is under investigation. The die-back of single branches is slowly followed (in 10 to 11 years) by the death of the whole crown. The bark was necrotic in places near the site of infection and a sector of the underlying wood was discoloured. Above this point the branch was usually dead. Fructifications of *Diaporthe taleola* were present on the dead branches, but so far the fungus has not been isolated from the infected wood. The disease is evidently distinct from that caused by *Chalara quercina* in the United States [ibid., 28, p. 552], but the possibility of a connexion with *Diplodia quercina*, reported on oak from Belgium [ibid., 28, p. 40], is not excluded.

Thirumalachar (M. J.) & Pavgi (M. S.). **Sooty stripe disease of Bamboo in India.** —*Bull. Torrey bot. Cl.*, 77, 5, pp. 385–388, 6 figs., 1950.

Bamboo shoots near the Benares Hindu University were killed by a fungus forming linear sooty stripes, which was identical with one collected near Gorakhpur, India, and referred in error to *Ustilago shiraiana* P. Henn.

Infection was initiated near a wounded stem or on broken young shoots, working downwards as a die-back. The diseased tissues usually dried up and became greyish brown. Soon afterwards the entire area affected was covered by linear, erumpent sori, 2 to 8 mm. long when mature and often coalescing to form long striae. The spores were formed within the sori at the ends of loose hyphae. They germinated readily in water within 30 hours, developing long septate germ-tubes. Germinating spores transferred to potato dextrose agar formed a white, cottony mycelial growth. When incubated at room temperature abundant spore development occurred after ten days. The hyphae were septate, branched, and multi-

nucleate in stained preparations. The ovate-elliptic to spherical, chocolate brown, thick-walled spores with a pale lenticellular ridge measured 7·5 to 12 (average 10·3) μ and were formed in clusters on short stalks. Spores produced naturally on the host were more opaque and measured 7·5 to 11·5 (average 10·5) μ. In wound inoculation experiments infection occurred in young bamboo shoots after 45 to 50 days.

This study showed the fungus to be a species of *Papularia* which has been referred to *P.* (*Coniosporium*) *arundinis* [*R.A.M.*, 17, p. 558].

Castellani (E.) & Graniti (A.). **Su un Verticillium parassita del Cronartium asclepiadeum.** [On a *Verticillium* parasitic on *Cronartium asclepiadeum*.]—*Nuovo G. bot. ital.*, N.S., 56, 4, pp. 628–638, 1 fig., 1949. [Published 1950. English summary.]

During a study on pine blister rust (*Cronartium asclepiadeum*) [*R.A.M.*, 26, p. 229], which in recent years has been very serious in the Appenine regions of Tuscany and Emilia, it was observed that the aecidia were parasitized by a *Verticillium* which penetrated the aecidiospores and developed abundantly within them, the infected spores becoming almost hyaline. The *Verticillium* produced hyaline, continuous, cylindrical conidia, rounded at the extremities, measuring 2·5 to 7 by 1 to 2 μ.

A comparison of the authors' fungus with exsiccata of *V. hemileiae* from Madagascar [ibid., 27, p. 79; p. 155 of that work] showed that the two organisms were closely similar in morphology, while the length of the conidia was the same. The conidial measurements of *V. compactiusculum* [ibid., 17, p. 102], *V. album-minimum* [loc. cit.], and *V. coccorum* [loc. cit.] in culture were, respectively, 3·5 to 9 (mean 4·93) by 0·8 to 1·1 (mean 0·96) μ, 3·5 to 8 (mean 5·42) by 1 to 1·8 (mean 1·48) μ, and 2·5 to 7 (mean 4·71) by 0·9 to 1·9 (mean 1·53) μ. It is concluded that *V. album-minimum* is a distinct specific entity and that the authors' fungus and *V. hemileiae* should be referred to *V. coccorum*.

When fresh uredospores of *Puccinia glumarum* from *Koeleria phleoides*, *P. baryi* from *Brachypodium pinnatum*, *P. sorghi* from maize, and *P. pruni-spinosae* from apricot were floated in a little sterile water with a suspension of *Verticillium* conidia from *Cronartium*, growth of the *Verticillium* was abundant, particularly in the presence of *P. pruni-spinosae*, the uredospores being parasitized. Alone the conidia grew very sparsely.

Robak (H.). **On the identity of Diplodia diversispora Robak n.sp. ad int. and of a related fungus likewise isolated from dead coniferous bark tissue.**—*Svensk bot. Tidskr.*, 44, 2, pp. 465–472, 2 figs., 1950.

Further observations on the fungus isolated from dead bark of *Abies grandis* and *Picea abies* in western Norway and described as *Diplodia diversispora* n.sp. ad. int. [*R.A.M.*, 29, p. 68] have induced the author to transfer it to *Cryptosporiopsis* as *C. diversispora* n.sp. [n.comb.]. The species differs from the very similar *C. abietina* (*Myxosporium abietinum*: perfect state *Pezicula livida*) [ibid., 29, p. 536] in its narrow A- and B-conidia and the absence in the latter of branching and septation. Another fungus with *Pezicula* apothecia isolated from *A. grandis* and *A. balsamea* is described as *C. balsameae* n.sp. Pending the development of their fructifications on natural substrata, the diagnoses of both these fungi should be regarded as provisional.

Hepting (G. H.) & Roth (E. R.). **The fruiting of heart-rot fungi on felled trees.**—*J. For.*, 48, 8, Part I, pp. 332–333, 4 figs., 1950.

Sixty living trees near Asheville, North Carolina, and Edinburg, Virginia, bearing sporophores of *Fomes rimosus*, *F. everhartii*, *F. pini*, *F. robustus*, *F. connatus*,

Polyporus hispidus, *P. sulphureus*, *P. obtusus*, *P. rheades*, and *P. schweinitzii* were felled from 1935 onwards and the sporophores removed. Every fungus species represented, but not every tree, produced some new sporophores on the felled trunks, but the numbers were small compared with standing living trees. *P. sulphureus* on oak and *F. pini* on hard pines fruited again on two stumps. *Fomes* spp. regenerated sporophores as numerous as those originally on the trees up to five years after felling but fruiting practically ceased between 10 and 15 years. *Polyporus* spp. formed only a quarter as many sporophores in the fifth year as were originally present and all fruiting then ceased except in the case of *P. sulphureus*. In contrast standing trees were still producing 10 to 60 per cent. *Fomes* sporophores (except *F. connatus*, 0 per cent.) after 10 years and 17 to 100 per cent. *Polyporus* sporophores (except *P. rheades*, 0 per cent.) after five years. It is concluded that felling sporophore-bearing trees reduces the length of time the fruiting bodies will act as sources of infection.

De Baun (R. M.), Kudzin (S. F.), & Schubert (W. J.). **On the mechanism of enzyme action. XLI. A role of α-ketoglutaric acid in the carbohydrate metabolism of wood-destroying molds.**—*Arch. Biochem., N.Y.*, 26, 3, pp. 375–381, 1950.

Experimental evidence is adduced for the formation of oxalic acid from α-ketoglutaric acid by the wood-destroying fungi *Lentinus lepideus* and *Trametes cinnabarina* [*R.A.M.*, 24, p. 393]. A pathway of dehydrogenation reactions is indicated, passing through succinic acid and four other carbon acids involved in the genesis of oxalic from α-ketoglutaric acid [cf. ibid., 29, p. 445].

Bagchee (K.). **Toxicity tests by woodblock method.**—*Indian For.*, 76, 4, pp. 156–158, 1950.

Particulars are given of experiments at the Forest Research Institute, Dehra Dun, to determine the toxicity of cashew nut (*Anacardium occidentale*) oil to *Polystictus sanguineus* on sal [*Shorea robusta*] woodblocks. The average loss of weight after 18 weeks in the blocks treated with 5, 10, 20, and 50 per cent. of the oil was 19·4, 16·9, 25·3, and 23·8 per cent., respectively, compared with 44·2 per cent. in the controls. The oil of *A. occidentale* cannot, therefore, be regarded as a suitable preservative against fungal decay.

Hatfield (I.), Shumard (R. S.), Vaughn (T. H.), & Hill (E. P.). **The unseasoned wood disc method for evaluating sap-stain control chemicals.**—*Phytopathology*, 40, 7, pp. 653–663, 3 figs., 1 graph, 1950.

The object of a joint research programme of the Monsanto Chemical Company, St. Louis, Missouri, and the Wyandotte Chemical Corporation, Wyandotte, Michigan, was to gain further information on the efficacy of carbonates and bicarbonates, as well as borax, in combination with organic mercury compounds, in sap stain control [*R.A.M.*, 19, p. 574]. A full description is given of the 'unseasoned wood disk test method' used in the laboratory trials, the results of which are compared with those obtained at the Southern Lumber Company's mill, Warren, Arkansas.

Any species of wood may be used for the laboratory tests, fast-growing sapling logs, 3 to 4 by 4 to 6 in., being generally most convenient. The disks are incubated in standard 1-qt. Kerr-Mason jars, usually four per jar. Holes ½ in. in diameter are punched in the lids and plugged with cotton to permit the escape of volatile solvents or extractives and the entry of fresh air. In the bottom of each jar are placed three or four short lengths of 10-mm. glass tubing and the disks are separated from each other by sticks. The jars are maintained at a temperature of 80° F. and 75 per cent. relative humidity. Aqueous solutions containing the desired

concentrations of stain control chemicals are prepared in advance, four to six disks being dipped in each solution (1 l.) before inoculation and incubation. A minimum of 20 disks should be used for each chemical or concentration included in the tests. The circular disks, not more than $2\frac{3}{4}$ in. in diameter, are punched out of sections about $\frac{1}{2}$ in. thick cut with a band saw from a portion of the log free from knots and scars. After 15 seconds' immersion in the fungicides the disks are laid edgewise on glass rod racks for half an hour to allow the solution to penetrate the wood and the excess to drip off. They are then sprayed with a spore-mycelium suspension of an individual sap stain fungus, such as *Ceratostomella pilifera*, or mixture of fungi. Mould (*Aspergillus*, *Penicillium*, and *Trichoderma* spp.) spores are usually present on the wood in sufficient numbers to ensure inoculation, so that their addition is superfluous. The disks are then ready for transference to the incubation jars.

In one experiment the stain-inhibiting properties of ten formulations were compared on shortleaf pine (*Pinus echinata*) disks inoculated with *C. pilifera*, readings being made at weekly intervals for 110 days. A three weeks' incubation period was found to yield the most dependable and reproducible results. At the end of this time blocks treated with a 3·5 per cent. concentration of product A, consisting of 20 per cent. (by weight) sodium pentachlorophenate, 30 per cent. modified soda (hydrate), and 50 per cent. borax (hydrate), were entirely free from stain, as compared with 100 per cent. in the untreated. This formulation proved equally effective in a field test. Absolute elimination of stain was further accomplished in the laboratory tests by formulation J (89·8 per cent. sodium tetrachlorophenate, 4·8 per cent. sodium hydroxide, 0·4 per cent. sodium carbonate, and 5 per cent. water), while B (96 per cent. sodium pentachlorophenate and 4 per cent. sodium carbonate), D (16 per cent. sodium pentachlorophenate, 77 per cent. tetrachlorophenate, and 7 per cent. water), and E (92 per cent. sodium pentachlorophenate, 4 per cent. sodium hydroxide, and 4 per cent. water) reduced the incidence from 100 to 2, 1, and 2 per cent., respectively.

LUTHARDT (W.). **Das ausgelaugte Holz aus der künstlichen Zucht holzbewohnender Pilze.** [The depleted wood from the artificial culture of lignicolous fungi.]—*Holzforschung*, 3, 3, pp. 117–121, 8 figs., 1949.

In connexion with an inquiry into the potential further utilization of wood after its use as a substratum for edible fungi in Germany, some data are given on the composition of beech wood after exhaustion by *Pholiota mutabilis* [*R.A.M.*, 25, pp. 518, 531]. At the end of the maximum period of $3\frac{1}{2}$ years the specific gravity of the wood was 0·22, as compared with 0·63 at the outset of the test; solubility in hot water 4·63 and 0·85, respectively; in 1 per cent. sodium hydroxide 22·57 and 12·65; pentosan-free cellulose content 33·18 and 38·81; total sugar calculated as glucose, after total hydrolysis, 56·82 and 57·32; total pentosan content 28·59 and 24·71; and lignin content 23·36 and 22·93. The mycelium of *P. mutabilis* causes a cubical rot, proliferating uniformly through the heart- and sapwood, in which it produces clearly discernible black spots.

MCKEEN (C. D.). **Arasan as a seed and soil treatment for the control of damping-off in certain vegetables.**—*Sci. Agric.*, 30, 6, pp. 261–270, 1 fig., 1 graph, 1950.

This is a full account of experiments carried out at Harrow, Ontario, a preliminary abstract of which has been noticed [*R.A.M.*, 28, p. 499], on the effectiveness of arasan as a seed, soil, and combined seed and soil treatment against damping-off (*Pythium* spp. and *Rhizoctonia* [*Corticium*] *solani*) of [chilli] pepper, tomato, spinach, Spanish onion, cucumber, muskmelon, lettuce, and celery [ibid., 29, p. 283]. The tests were made in standard wooden flats in the greenhouse. The disease was more effectively controlled in spinach and onion [ibid., 29, p. 346] by soil treatment

(3·14 gm. per cu. ft.) than by seed treatment (0·4 and 0·24 per cent., respectively); the results for seed, soil, combined soil and seed, and no treatment were for spinach 22·4, 43·3, 50·4, and 17·2 per cent. emergence, respectively, and 23·7, 9, 10·5, and 27·1 per cent. post-emergence damping-off; for onion the corresponding figures were 30·2, 75·5, 82·5 and 20·5 per cent. emergence and 42·1, 15·2, 10, and 54·8 per cent. damping-off.

Significantly better stands of chilli seedlings were obtained from the combined treatment than from either treatment separately, and soil treatment controlled the post-emergence phase of the disease for a longer period than seed treatment.

With tomatoes, seed treatment (0·75 per cent.) gave 89·4 per cent. emergence and 2·1 per cent. damping-off, soil treatment 75·6 and 7·9 per cent., respectively, the combined treatment 85·6 and 2·2 per cent., respectively, and no treatment 65·1 and 23·4 per cent., respectively.

In a further experiment in which arasan seed (2·5 per cent.), soil (3·14 gm.), and combined treatments were compared with formaldehyde dust in the soil (215 gm. per cu. ft.) emergences were 96·7, 91·7, 96·2, and 97·5 per cent., respectively, and damping-off 0, 0·3, 0, and 0·3 per cent., the corresponding figures for no treatment being 53·5 and 2·8. The combined arasan treatment usually retarded emergence by a few hours.

Arasan seed treatment gave high protection to cucumbers and muskmelons, but soil treatments allowed high post-emergence damping-off of muskmelons. Applied to seed or soil, arasan was toxic to lettuce and celery, delaying and reducing emergence.

Zattler (F.). **Ein Beizversuch zur Bekämpfung des Schwarzwerdens der Rettiche.** [A disinfection experiment for the control of Radish black root.]—*Pflanzenschutz*, **2**, 5, pp. 53–55, 1 fig., 1950.

A combined experiment was performed at the Bavarian Institute for Agriculture and Plant Protection, Munich, to determine the influence of fertilizers and seed treatment in radish black root (*Aphanomyces raphani*) control [*R.A.M.*, **29**, p. 490], using the Münchener Bier variety. The soil was already well supplied with nutriment, and the effects of the several fertilizers were unimportant and non-characteristic. On the other hand, seed treatment with 0·25 per cent. ceresan (30 minutes' immersion) resulted in an increased root yield of nearly one-third over the untreated, the incidence of infection being reduced from 79 to 62 per cent. by the treatment, with a substantial reduction in the severity of the symptoms; in addition the incidence of the radish fly maggot ('Madigkeit') [*Erioischia* sp.] was reduced from 40 to 18 per cent.

Drachovská-Šimanová (Miroslava). **Cercosporiosa—nejrozšířenější choroba Cukrovky.** [Cercosporiosis—the most widespread Beet disease.]—*Ochr. Rost.*, **22**, 3–4, pp. 105–120, 6 figs., 1949. [French summary.]

Beet leaf spot (*Cercospora beticola*) [*R.A.M.*, **26**, p. 440] is common in Czechoslovakia, especially under favourable conditions of humidity and temperature [ibid., **27**, p. 212]. Epidemics can be expected after relatively mild winters followed by warm springs without late frosts, and wet summers with average daily temperatures of 20° to 25° C. Based on the incidence of the disease during the 1937 to 1948 period, the sugar beet districts were divided into four groups with the following recommended control measures. (1) Should the disease occur in districts where it has not previously occurred the affected leaves should be immediately destroyed; (2) in regions with isolated cases, the diseased leaves and debris should be destroyed, and weeds eliminated; (3) where there is medium incidence additional measures should include spraying or dusting with copper preparations immediately after the first symptoms appear, a three-year crop rotation at least, wider spacing, and choice

of more suitable plots; (4) where the disease occurs regularly preventive sprays should be employed in addition, and resistant varieties grown, if found satisfactory. Most of the introduced resistant varieties develop partial infection in Czechoslovakia.

ERNOULD (L.). **La graine de Betterave transmet-elle la jaunisse et la mosaïque?** [Does Beet seed transmit yellows and mosaic?]—*Publ. Inst. belge Amélior. Better.*, 18, 3, pp. 89–94, 2 figs., 1950. [Flemish and English summaries.]

Following a brief discussion of previous studies on the transmissibility through the seed of plant viruses in general, the writer summarizes the experiments hitherto performed in this connexion with the beet mosaic and yellows viruses [cf. *R.A.M.*, 28, p. 501] and describes the results of his own tests under strictly controlled conditions in a greenhouse at Tirlemont, Belgium, in 1948–9 [ibid., 29, p. 344].

Not a single case of transmission was observed among the 919 plants raised from seed, of which 649 were produced by seed collected on seed-bearers heavily infected by both viruses. On the other hand, 35 out of 105 plants (33 per cent.) of the progeny of the Irish line 41 [ibid., 28, p. 264] developed typical yellows symptoms. The exact identity of the virus concerned, however, remains in doubt.

GYSEL (A.). **Über die Virusgelbsucht der Zuckerrübe : Sammelreferat.** [Sugar Beet yellows virus: a compilation.]—*Schweiz. landw. Mh.*, 28, 6, pp. 219–221, 1950.

The most important virus diseases of sugar beet in Switzerland are mosaic and virus yellows [see preceding abstract]. The information available to date on the symptoms, transmission, and control of the latter is summarized.

WARK (D. C.). **The susceptibility of Peas to four diseases occurring naturally in the Australian Capital Territory.**—*J. Aust. Inst. agric. Sci.*, 16, 1, pp. 32–33, 1950.

From 1946 to 1949 at Canberra, the effects of powdery mildew (*Erysiphe polygoni*) [*R.A.M.*, 28, p. 53], *Ascochyta* blight (*A. pisi*) [ibid., 29, p. 288], *Mycosphaerella* blight (*M. pinodes*), and bacterial blight (*Pseudomonas pisi*) [ibid., 28, p. 557] were observed on over 300 pea varieties and related species belonging to the genera *Pisum* and *Lathyrus*.

The young leaves of all pea plants whether naturally or artificially infected were resistant to powdery mildew, while mature leaves were susceptible. Six varieties reported to be immune in Peru [ibid., 28, p. 42] became infected under Canberra conditions.

Seedlings of any variety were more resistant to spray inoculation with *A. pisi* than older plants. Late varieties were usually more resistant than early ones even when inoculated at the same time after planting. Austrian Winter was highly resistant to stem girdling, less resistant to leaf spotting, and susceptible to pod spotting. All the other pea varieties were susceptible to all phases of the disease. *L. aphaca*, *L. hirsutus*, and *L. pubescens* showed some field resistance, but were susceptible to spray inoculation.

All pea varieties were susceptible to *M. pinodes*. *L. hirsutus* remained free from symptoms in the field, but became readily infected by spray inoculation. Pea plants tend to become more susceptible with approaching maturity.

None of the varieties and species tested showed any appreciable resistance to bacterial blight. Under all conditions the varieties with the smallest lesions belonged to the group with edible pods.

HAGEDORN (D. J.) & WALKER (J. C.). **The relation of Bean virus 2 to Pea mosaic in Wisconsin.**—*Phytopathology*, 40, 7, pp. 684–698, 6 figs., 1950.

The bean yellow mosaic virus (abs. in *Phytopathology*, 38, p. 13, 1948; 39, p. 11, 1949) was found on peas in Wisconsin in 1946. It was widespread on that host and as it was somewhat different from other strains, detailed studies on this new

strain were made at the Wisconsin Agricultural Experiment Station [*R.A.M.*, 29, p. 284]. Characteristic symptoms of isolate 1 of the bean yellow mosaic virus (bean virus 2) on Perfected Wales peas include foliar mottling, occasional very slight vein-clearing, and little or no wrinkling or dwarfing. There was not much reduction in the size of greenhouse plants. Field symptoms were more severe.

Stringless Blue Lake was the most susceptible bean (*Phaseolus vulgaris*) variety to isolate 1. Necrosis of the veins and necrotic streaks on the stem and leaf petioles developed on the unifoliate leaves 18 days after inoculation, and generalized stunting was very marked. The trifoliate leaves, of which only two sets were formed as against five on healthy plants, were severely dwarfed, with conspicuous apical malformation and downward curling. Necrotic spots were formed on and between the veins, and the leaf surface was much roughened. Portions of the leaves died from the tip backwards; in some cases entire leaves were killed. Diseased Michelite bean leaves showed a striking mottle, resulting from the presence on and between the veins of irregular chlorotic areas. The infected foliage was rugose and abnormally small. Comparable symptoms developed on Great Northern U. of I. No. 1. On Idaho Refugee the virus caused moderate plant stunting, unifoliate leaf epinasty, and dwarfing, pronounced mottling, and slight downward curling of the trifoliate leaves. On this variety the symptoms of isolates 2, 3, and 4 of the yellow mosaic virus from peas in other localities in Wisconsin were similar to, but not identical with, those of 1.

Red and crimson clovers reacted to inoculation with isolate 1 by the development of vein-clearing, following by interveinal mottling. Foliar rugosity and dwarfing were moderate on both hosts, but infected crimson clover plants were severely stunted. A peculiarity of the pale green spots between the veins of alsike clover leaves was the frequent presence in their centres of small areas of normal green tissue. White sweet clover (*Melilotus alba*) leaves showed vein-clearing and chlorotic mottling, while those of yellow sweet clover (*M. officinalis*) displayed prominent yellow areas of various sizes and shapes, nearly always with a patch of dark green tissue on one border. The symptoms induced on these hosts by isolates 2, 3, and 4 resembled the foregoing. Lucerne, Ladino white clover, and cowpea were not susceptible.

The results of experiments to determine the relation of temperature to the development of bean yellow mosaic virus showed that the typical symptoms did not develop until 48 days after inoculation with isolate 1 at 16° C., the corresponding incubation periods for 20°, 24°, and 28° being 20, 15, and 12 days, respectively. Isolate 1 infected six out of 18 pea and all the 12 bean varieties tested. Its dilution end point was 1 in 100,000, ageing was resisted for 24 to 48 hours, and thermal inactivation occurred between 60° and 64°. Transmission by the pea aphid (*Illinoia* [*Macrosiphum*] *pisi*) was readily effected both in controlled greenhouse tests and under natural field conditions. Seed transmission was not observed. The results of cross-protection tests demonstrated similarity between the four pea isolates and typical bean yellow mosaic virus in their capacity to mitigate the severity of the pod-distorting strain [loc. cit.] on Michelite beans.

Reinking (O. A.). **Fusarium strains causing Pea and Bean root rot.**—*Phytopathology*, 40, 7, pp. 664–683, 6 figs., 1950.

Fusarium solani var. *martii* f. 2, the agent of pea root rot in the United States [*R.A.M.*, 21, p. 245; 22, p. 285], is characterized by shorter and narrower spores, 38 by 4·8 μ, than the bean [*Phaseolus vulgaris*] root rot organism, *F. solani* var. *martii* f. 3 [ibid., 23, p. 410] (44 by 5·5 μ). The virulent pea strains used in tests at the Agricultural Experiment Station, Geneva, New York, had slightly shorter and broader spores than the type [of form 2], with which the moderately pathogenic

isolates agreed more closely. On the other hand, the virulent bean strains approximated more nearly to the type [of form 3] than the mildly parasitic isolate with rather smaller spores. The production of dense masses of pionnotes (normally blue-green in the pathogenic strains, but sometimes green or cream-buff) is characteristic of both the pea and bean forms of *F. solani* var. *martii*. On the basis of these morphological and cultural characters some closely allied saprophytic strains may be identified, but in general, inoculation tests are the only safe criterion for establishment of the true parasitic isolates of both organisms.

Previous studies indicated that pea and bean root rots caused by forms 2 and 3 of *F. solani* var. *martii*, respectively, were distinct and that one form could not attack the host of the other [ibid., 14, p. 613]. However, in the author's experiments strain 1000, isolated from a diseased bean, proved to be a virulent parasite of peas, though it was only slightly parasitic on beans. Some strains were much more pathogenic than others to their respective hosts. For instance, strain 1002, isolated from pea on 14th June, 1940, caused much more rapid wilting and death of its own host than any other pea strain.

All tests from 1937 onwards confirmed the existence of two distinct parasites, one of peas and the other of beans. In no case was severe infection consistently produced by the pea pathogens on beans or vice versa. The mild symptoms resulting from infection of beans by the pea strains and reciprocally were more conspicuous during the most susceptible phases of the hosts, i.e., at flowering and fruiting time. The flecking and slight streaking developing on beans attacked by pea strains and conversely are an expression of the definite resistance of each host to isolates from the other. The absence of infection on individual pea and bean plants of the same variety in some tests would seem to denote differences in susceptibility. None of the varieties used was genetically pure.

Stoll (K.). **Ein Beitrag zur Kenntnis der Chlamydosporenkeimung von Ascochyta pinodella Jones.** [A contribution to the knowledge of chlamydospore germination in *Ascochyta pinodella* Jones.]—*NachrBl. dtsch. PflSchDienst* (*Berl.*), N.F., 3, 5–6, pp. 96–100, 1 graph, 1949.

At the Aschersleben [Saxony] branch of the Biological Institute the author investigated the conditions governing chlamydospore germination in one of the agents of pea root rot, *Ascochyta pinodella* [*R.A.M.*, 19, p. 510]. Activation of the spores proved to be practicable within a narrow temperature range, the germination percentages on agar plates at room temperature after 20 hours following a short preliminary heat treatment in a drop of pea decoction agar at 65°, 70°, 80°, 90°, and 100° C. being 50 to 70, 60 to 70, 10 to 20, 0 to 1, and 0, respectively. Germinable spores produced in a highly dilute pea pectin solution were much more sensitive to treatment with a 0·1 per cent. germisan solution than resting spores or those activated by heat, a matter of practical importance in connexion with the assay of fungicides.

El-Helaly (A. F.). **Bordeaux mixture for the prevention of rust and chocolate spot of Beans.**—*Phytopathology*, 40, 7, pp. 699–701, 1950.

In further studies from 1939 to 1942 spraying with 0·25 per cent. Bordeaux mixture, using a small machine, such as the 1½-h.p. hydraulic motor pump, proved to be a satisfactory and practical method of combating bean [*Vicia faba*] rust (*Uromyces fabae*) and chocolate spot (*Botrytis fabae*) over large acreages in Lower Egypt [*R.A.M.*, 20, p. 442]. In 1940 the applications were made on 14th January and 3rd and 26th February; in 1941 on 16th January, 10th February, and 10th March; and in 1942 on 22nd January, 14th February, and 3rd March on one farm, on 25th January, 15th February, and 5th March on a second, and on 24th January, 16th February, and 4th March on a third.

Over the whole experimental period the incidence of rust ranged from a trace to 20 per cent. and that of chocolate spot from a trace to 15 per cent. compared with 25 to 100 and 10 to 90 per cent., respectively, in the controls. The yields in the sprayed and untreated plots ranged from 3·86 to 10·65 and 1·51 to 9·07 ardebs [1 ardeb = 1·98 hl.] per feddan [= 0·42 ha.], respectively, and the net profits from the treatment from £2·21 to £5·11 (Egyptian).

Geeseman (G. E.). **Physiologic races of Peronospora manshurica on Soybeans.**—*Agron. J.*, 42, 5, pp. 257–258, 1 fig., 1950.

In 1946 ten pure-line soy-bean varieties reacted differently at different times to downy mildew (*Peronospora manshurica*) [*R.A.M.*, 26, p. 156], suggesting the existence of distinct physiologic races within the fungus. This hypothesis was subsequently confirmed by inoculation experiments with nine collections from Wisconsin, Illinois, Mississippi, Missouri, Alabama, and Tennessee on seven varieties, namely, Chief, Manchu 3, T117, Mukden, Dunfield, Richland, and Illini, the results of which demonstrated the presence of at least three biotypes. The five varieties first-named were immune from the first seven collections while Richland and Illini were susceptible; all these collections were classified as physiologic race 1. Race 2 (the eighth collection) caused slight infection on Chief, Manchu 3, T117, Mukden, and Dunfield and heavy infection on Richland and Illini. Race 3 (the ninth collection) differed from race 1 only in inducing a large fleck, resistant type of lesion on Richland.

Green (D. E.) & Hewlett (M. Ann). **Parsnip canker.**—*J. Minist. Agric.*, 57, 5, pp. 216–222, 1950.

In this paper (a summary of a report on investigations carried out from 1946 to 1948 at the request of the Horticultural Group of the Agricultural Improvement Council) the authors describe studies conducted mainly at Wisley, Surrey, on parsnip canker [*R.A.M.*, 6, p. 205]. The condition is defined as a discoloured area, usually on the shoulder of the root, distinct from shoulder canker caused by *Phoma* sp., at first superficial and brown to reddish-brown, later often changing to blue-black. The canker becomes depressed and frequently displays considerable dry rot, though later in the year a wet form may develop.

Extensive isolations and inoculations did not indicate that the condition is caused by any parasitic organism or insect attack. Soil analyses showed no relationship between the canker and nutrient deficiency. However, at Wisley, from October to January, inclusive, 1948–9, incidence increased steadily in test plots and ranged from 4·2 to 17 per cent. in light soil and from 48·3 to 95·2 per cent. in heavy. The only differential factor here that could affect incidence would seem to be moisture. No canker occurred until the end of August. At Wisley the first signs were noted by mid-September while in a trial plot at Milford, Surrey, there were 25 per cent. cankered roots, though few were severely affected. Adequate moisture and cool temperatures appear to be necessary for canker to develop. The fact that the trouble is influenced by weather conditions would explain its severity in certain seasons, usually wet ones, and its comparative absence in some dry ones, such as 1947. Even in that year, however, there was a good deal of canker in trial plots at Wisley in November, which would seem to indicate that in the late months of the year the usual rains may induce canker even at the end of a dry season. Canker develops about the same time, whether the crop is sown early or late.

The weight of the crop increases in November, but in heavy soils this is offset by increase in canker. After November, there does not appear to be any gain in weight and there is an ever-increasing risk of loss from canker. It would appear best to lift parsnips from heavy land in October and from light land by November.

Varietal resistance trials in which 17 stocks of parsnips embracing ten well-known varieties were sown in different parts of England gave no indication that any variety tested possessed resistance, though the authors consider that individual roots showed some degree of resistance.

CASTIGLIONE (R. DI P.). **Le virosi della Spinacio (Spinacia oleracea L.).** [The viroses of Spinach (*Spinacia oleracea* L.]—*Agricoltura ital.*, 49, N.S. 5, pp. 86–96, 1949. [French and English summaries. Received June, 1950.]

A disease attacking spinach at Vecchiano, near Pisa, and believed to be of virus origin was characterized in some cases by yellowish interveinal spots at the tips and margins of the leaves. In others the speckling was rendered more evident by an intense yellowing of the chlorotic tissues followed by necrosis beginning from the tips and margins. The confluence of the necrotic areas imparted a withered aspect to the leaf. In yet other cases the mosaic effect was accompanied by swellings.

The author lists 19 viruses recorded from spinach [*R.A.M.*, 24, p. 513], describing their symptoms and method of transmission.

NELSON (R.). **Control of Celery early blight in 1948 and 1949.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 32, 4, pp. 562–574, 3 figs., 1950.

In 1949 early blight of celery (*Cercospora apii*) [*R.A.M.*, 18, p. 722; 29, p. 88] appeared early in Michigan and caused an estimated loss in Kalamazoo county of $100,000, the State loss amounting to over $350,000. In experimental work between 1933 and 1940 a new dust was developed that gave effective control, the formula being yellow cuprous oxide 6 to 7 lb., fine dusting sulphur 30 lb., and loom-kill talc 63 to 64 lb. Under some seasonal conditions, however, the yields of the dusted plants were not compatible with the degree of control obtained and the dust may have produced minor injury to the plants.

In further work in 1948 dithane Z–78 (6 lb. per 100), dithane Z–78 (6 lb.) plus dusting sulphur (30 lb.), cuprous oxide (6 lb.) plus dusting sulphur (30 lb.), tribasic copper sulphate (13 lb.), tribasic copper sulphate (13 lb.) plus dusting sulphur (30 lb.), and the same plus 4 lb. NuZ [zinc oxysulphate] (55 per cent. zinc) were compared, each being applied eight times between 2nd July and 1st September. The best control was given by dithane Z–78 with sulphur (disease-control rating 1, net yield in 20-lb. crates, 2,320), tribasic copper sulphate-sulphur-NuZ being slightly less effective (2 and 2,120).

In 1949 dithane-sulphur again gave the best control and the highest yield (1 and 1,790); actidione dusts (1 and 2 per cent.) [ibid., 29, p. 373] were ineffective against early blight but stimulated vegetative development of the crop. Michigan celery growers are recommended to try the dithane Z–78 sulphur dust.

SCHWARZ (M. B[EATRICE]) & HARTLEY (C.). **De selectie van Schwarz 21, een tegen slijmziekte resistente lijn van Arachis hypogaea.** [The selection of Schwarz 21, a line of *Arachis hypogaea* resistant to slime disease.]—*Landbouw*, 22, 5–6, pp. 223–244, 1950. [English summary.]

Nearly 100 groundnut seed samples were collected in different parts of Indonesia in 1921 and 1922 with the object of testing for resistance to slime disease (*Bacterium* [*Xanthomonas*] *solanacearum*) [*R.A.M.*, 17, p. 162]. They fell into three groups, of which only one, an excellent commercial bunch type designated 'Holle', was adjudged to be of value for the end in view.

Mass selections were obtained by growing the samples in heavily infested soil. The strains retained for further trial came from mother plants surviving an attack of sufficient intensity to kill the neighbours for a distance of 15 cm. on either side. Progeny tests were first carried out in irrigated fields at Buitenzorg (now Bogor) at

different seasons and were later extended to other localities. Either the standard Tuban variety or Pure Line 21, both highly resistant to slime disease, were sown in control plots in the original trials, and only those strains were retained which regularly surpassed the standard in resistance.

The 14 most resistant lines were 15N, 15AB, 15BH, and 15KB from Madjalengka, 16K (probably identical with Schwarz 21) from Plumbon, 15C, 15S, 15W, 15AK, 15BC, and 15BG from Madjalengka, and 16P, 16BA, and 16BD from Plumbon. In general, the strains and populations showing high resistance in one region reacted similarly in other places, a characteristic which greatly simplified the work of selection.

Drummond-Gonçalves (R.). **Podridão das raizes.** [Root rot.]—*Biológico*, 16, 1, pp. 17–18, 1950.

This is a popular note on the root rot caused by species of *Rosellinia* in damp, badly drained plantations, e.g., of cassava, and orchards in São Paulo, Brazil, and its control. When detected in the initial stage of infection, the plant or tree may be saved by extirpation of the rotted roots and scraping of the slightly decayed tissues, followed by the application of Bordeaux paste and, a few days later, by painting the larger cuts with an asphalt dressing. The collar and upper roots should then remain exposed to the sun for several months. In advanced cases treatment is not worth while, and the diseased plants should be eradicated and burnt, taking care that no root fragments are left in the holes to set up fresh foci of infection. Disinfection of the soil with quicklime, avoidance of injuries, and the use of trenches are advocated.

Nisikado (Y.), Kimura (K.), & Miyawaki (Y.). **Studies on the effect of kinds of tree in culture medium upon the growth of Cortinellus berkeleyanus. I. The mycelial growth in pure culture on the sawdust medium prepared of various kinds of tree.**—*Ber. Ōhara Inst. landw. Forsch.*, 9, 1, pp. 39–60, 1 graph, 1942. [Received November, 1950.]

In studies to determine the most suitable kinds of tree for the provision of sawdust media for the culture of the edible 'shiitake' fungus (*Cortinellus berkeleyanus*), which has become very popular of recent years in Japan [cf. *R.A.M.*, 15, p. 72, and next abstracts], highly satisfactory results were obtained on *Carpinus carpinoides* [*C. japonica*], *Petrophiloides* [*Platycarya*] *strobilacea*, *Cornus controversa*, *Fagus crenata*, and the sapwood only of *Castanea crenata*. *Tsuga sieboldii*, *Aesculus turbinata*, *Cercidophyllum japonicum*, *Cinnamomum japonicum*, *Machilus thunbergii*, and *Euptelea polyandra* also promoted reasonably good development. The mycelium spread more rapidly on sawdusts with a particle diameter of 1·5 to 3 mm. than on those of smaller dimensions. The optimal ratio of sawdust to water was 2:1. The growth of *Cortinellus berkeleyanus* was stimulated by the enrichment of the medium with rice or wheat bran, sugar, and potato starch.

Nisikado (Y.), Mihasi (T.), & Nakayama (T.). **Illustrations and descriptions of fungi injurious to the culture of Shiitake Mushroom. I.**—*Ber. Ōhara Inst. landw. Forsch.*, 9, 1, pp. 61–70, 10 pl. (2 col.), 1942. [Received November, 1950.]

The recent wide extension due to technical improvements in 'shiitake' (*Cortinellus berkeleyanus*) mushroom culture in Japan [see preceding and next abstracts] has been accompanied by heavy reductions in the crop owing to the secondary fungal invasion of the logs used as substrata. A thorough knowledge of the fungi concerned is an important preliminary to effective control, and descriptions are accordingly given of seven species of *Stereum* involved, together with observations on

their synonymy, habitat, geographical distribution, appearance on the logs, and other points of interest. *S. umbrinum*, *S. fasciatum* [*R.A.M.*, 25, p. 143], *S. roseo-carneum*, *S. gausapatum* [ibid., 22, pp. 190, 333], and *S. vibrans* occur on oak (*Quercus* spp.), *S. hirsutum* [ibid., 28, p. 650] on chestnut (*Castanea crenata*) and oak, and *S. roseum* on oak and *Prunus serrata*. A key to the species of *Stereum* is appended.

Nisikado (Y.), Mihasi (T.), & Nakayama (T.). **Illustrations and descriptions of fungi injurious to the culture of Shiitake Mushroom. II.**—*Ber. Ōhara Inst. landw. Forsch.*, 9, 2, pp. 252–258, 6 pl. (2 col.), 1943. [Received November, 1950.]

This further contribution to the knowledge of the fungi deleterious to the logs on which the 'shiitake' mushroom (*Cortinellus berkeleyanus*) is cultured in Japan [see preceding and next abstracts] comprises annotations on *Polyporus gilvus* [*R.A.M.*, 28, p. 148] and *P. illicicola* on oaks (*Quercus* spp.), *P. adustus* [ibid., 26, p. 36; 28, p. 596] on oak and *Carpinus japonica*, *P. pocula* on oak and *Platycarya strobilacea*, *Polyporus caesius* and *P. profissilis* on *Platycarya strobilacea*, *Polyporus chianeus* on oak and beech (*Fagus sieboldii*), *Polystictus pergamenus* [ibid., 24, pp. 169, 392; 26, p. 36] on oak, and *Polyporus ravidus* on the last-named and chestnut (*Castanea crenata*).

Nisikado (Y.) & Miyawaki (Y.). **On the relation of temperature and light to the development of sporophores in Cortinellus berkeleyanus.**—*Ber. Ōhara Inst. landw. Forsch.*, 9, 2, pp. 230–237, 1 pl., 1943. [Received November, 1950.]

The optimum temperature for sporophore production by the 'shiitake' mushroom (*Cortinellus berkeleyanus*) [see preceding abstracts] was found to be about 15° C., or 4° to 5° lower than that for mycelial growth. The sporophores were equally abundant in light and darkness under favourable temperature and moisture conditions. However, those formed in the dark were of irregular form, the stipe being longer and the pileus smaller than in normal sporophores, and the surface turned greyish or nearly white.

Nisikado (Y.) & Kimura (K.). **Principles of artificial propagation of Tricholoma conglobatum (Vitt.) Sacc. I. Germination of the spores and the cultural characters of the fungus mycelium.**—*Ber. Ōhara Inst. landw. Forsch.*, 9, 1, pp. 29–38, 4 pl., 3 graphs, 1942. [Received November, 1950.]

The minimum, optimum, and maximum temperatures for the growth of the mycelium of the edible fungus, *Tricholoma conglobatum*, which is highly esteemed in the Okayama district of Japan, were found to be 10° to 15°, 27°, and 32° C., respectively. The mycelium developed at a pH range of 3·6 to 10, with an optimum at 5·8 to 6·6, the corresponding values for spore germination being 3·2 to 9 and 4 and 7, respectively. Good growth was made on potato decoction agar with the addition of 5 gm. sucrose per 100 ml.

Instrucciones para el cultivo del 'Champignon'. [Instructions for Mushroom cultivation.]—*Publ. Divulg. téc. Minist. Agric., B. Aires*, 1, 4 pp., 1950. [Mimeoprinted.]

This extract from a paper by C. E. Giancola, entitled 'Cultivo del hongo de cama (champignon de couche) *Agaricus* (*Psalliota*) *campestris*, su comercialización e industralización [Cultivation of the bed Mushroom (champignon de couche) *Agaricus* (*Psalliota*) *campestris*, its commercialization and industrialization], comprises directions for the several operations involved in the establishment and maintenance of mushroom beds in Argentina.

Scharif (G.). **Anthracnose de la Vigne Gloeosporium ampelophagum (Pass.) Sacc.** [Anthracnose of the Vine, *Gloeosporium ampelophagum* (Pass.) Sacc.]—*Ent. Phytopath. appl., Tehran, 1949*, 9, 3 pp., 1 fig., 1949. [Persian, with French summary on p. 5.]

Anthracnose of the vine (*Gloeosporium ampelophagum*) [*Elsinoe ampelina*] was observed for the first time in Persia on 5th May, 1948. Infection occurred on 15 vines scattered through an orchard in a district of Gorgan where viticulture is scarcely practised, and the fungus is presumed to have been introduced on cuttings. Attention is drawn to the risk of spread to the immense vineyards of Azerbaidjan, in the humid climate of which the fungus would thrive.

Gupta (B. M.) & Price (W. C.). **Production of plant virus inhibitors by fungi.**—*Phytopathology*, 40, 7, pp. 642–652, 1950.

At the University of Pittsburgh, Pennsylvania, filtrates of 49 species of fungi grown for three weeks on maizemeal-beef-dextrose broth were tested for the presence of substances inhibitory to infection by the viruses of southern bean mosaic [*R.A.M.*, 27, p. 403], tobacco mosaic, and tobacco necrosis [ibid., 18, p. 540; 23, p. 55, *et passim*]. The filtrates were mixed with an appropriate concentration of virus in the proportion of one part of filtrate to one of virus and eight of buffer. In general, the virus activity was tested immediately after mixing and one hour and 24 hours later by the inoculation of 12 leaves of suitable hosts.

Filtrates from ten species inhibited by 80 per cent. and upwards infection by one or more of the experimental viruses. They were *Actinomyces* sp. (southern bean mosaic, 89 per cent.), *Aspergillus niger* (ditto, 91); *Botryotinia* [*Sclerotinia*] *convoluta* [ibid., 25, p. 235] (tobacco mosaic and tobacco necrosis, 94 and 93, respectively); *Guignardia bidwellii* (southern bean mosaic, 100); *Lambertella pruni* (ditto, 98); *Memnoniella echinata* (ditto, 89); *Neurospora sitophila* (ditto, 99); *Polyporus arcularius* (ditto, 88); *Trichophyton mentagrophytes* (ditto and tobacco mosaic, 87 and 89, respectively); and *Trichothecium roseum* (tobacco mosaic and southern bean mosaic, 98 and 99, respectively). The filtrates of a further 30 species inhibited the activity of at least one virus by 20 to 80 per cent., while less than 20 per cent. inhibition was caused by ten.

Because of the intensity of their effects, the filtrates of *T. roseum* and *N. sitophila* were selected for closer investigation. Both caused immediate loss of infectivity on admixture with a southern bean mosaic virus solution and their activity was unimpaired by six months' freezing. The *T. roseum* filtrate inhibited infection by the same virus when applied to the host leaves before or up to 30 minutes after inoculation. The infectivity of a non-infectious mixture of virus and filtrate was restored by simple dilution, suggesting that the inhibitory factor either forms a reversible combination with the virus or modifies host susceptibility, the latter being the more probable explanation.

The agent residing in the filtrate of *T. roseum* was shown to be thermostable, non-dialysable, and lyophilizable. Its resistance to heat denotes that it is not a protein, while the retention of activity by a cellophane membrane is evidence of its high molecular weight.

Interpretations of the regulations for the enforcement of the Federal Insecticide, Fungicide and Rodenticide Act.—*S.R.A., P.M.A., U.S. Dep. Agric.*, 167, 52 pp., 1950.

Slightly revised interpretations of these regulations [cf. *R.A.M.*, 29, p. 384] are given regarding, among others already mentioned, warning or caution statements for agricultural dusts and sprays containing 2,4–D.

Plant diseases.—*Agric. Gaz. N.S.W.*, 61, 7, pp. 365–368, 7 figs., 1950.

A serious virus disease of grapefruit at present widely distributed in New South Wales and known for over ten years as stunt bush, is undoubtedly identical with stem pitting in South Africa [*R.A.M.*, 29, p. 412]. A similar disease has been reported from Queensland. Marsh and Thompson grapefruits are the most severely affected varieties. Trees of Knight citron, Duncan grapefruit, and Ellendale mandarin have been found with severe stem pitting, but with no obvious effect on fruit or growth; Bengal citron showed slight stem pitting only. Eureka lemon, Washington Navel orange, Wheeny grapefruit, Imperial mandarin, and smooth Seville orange topworked on infected Marsh grapefruit grow vigorously and so far without symptoms. In the infected orchards the disease spreads fairly rapidly. In several localities trees in the vicinity of a severely stunted tree with wood and fruit symptoms bore fruit symptoms but only slight wood defects, obviously of recent origin. Surveys are in progress to determine the extent of the disease, and steps are to be taken to safeguard areas at present free from infection.

The destructive strawberry crinkle virus disease [ibid., 23, p. 378; 29, p. 571] has invaded most of the commercial strawberry varieties in New South Wales, so that growers are finding the crop unprofitable. Control depends on the elimination of the disease from planting stock, which should be selected only during the late autumn and winter when symptoms are most prominent and planted at least 100 yds from infected beds. During the spring and late autumn all affected plants in the new beds should be carefully rogued. The Department of Agriculture has undertaken a programme of building up stocks of healthy plants [cf. ibid., 29, p. 418].

The weather conditions in 1949 favoured the development of vine black spot [*Elsinoe ampelina*: ibid., 29, p. 143] and the 1950 crop is likely to be seriously affected.

Scottish Society for Research in Plant-Breeding. Report (abridged) by the Directors and Report of the Director of Research to the Annual Meeting, 27th July, 1950.—55 pp., 1950.

In the report by the Director of Research, W. Robb [cf. *R.A.M.*, 27, p. 579], it is stated that in work on the breeding of potato varieties resistant to blight (*Phytophthora infestans*) [ibid., 29, p. 430; 30, p. 69] some 16 different strains of the fungus, mostly of foreign origin, have been employed for test purposes, but only four or five appear to be of practical importance. The remainder have a limited range of hosts and are classified as relatively unimportant variants of the common strain. In tests during 1949 with strain E from East Africa [cf. ibid., 27, p. 224] a new mutant type, F, was isolated, with ability to attack certain varieties resistant to strains A, B, and E [loc. cit.]. The F strain appears to belong to the B group, and represents the highest degree of virulence so far attained within that group. Several wild species [of *Solanum*] show even greater resistance to blight than the commercial types, e.g., *S. simplicifolium*, which, when inoculated, gives a very weak growth of sporangiophores. An examination of isolates of local races of *P. infestans* occurring in Italy [cf. ibid., 4, p. 53] was carried out in collaboration with Dr. A. Mezzetti, Rome; minor differences in pathogenicity between races from different parts of the country were observed, but in some instances isolates from the same locality differed appreciably in virulence.

Many of the blight-resistant seedlings which have passed the initial trials have proved to be field-immune from virus X, while a few are field-immune from virus Y [cf. ibid., 28, p. 305].

The search for resistance to black leg (*Bacterium phytophthorum*) [? strain of *Erwinia carotovora*: loc. cit.; ibid., 29, pp. 52, 169] continues without success. Twenty-four representatives of *Solanum* with two cultivated varieties as controls

were used in agglutination tests with *E. carotovora*, and in every case the organism was unaffected, while in parallel tests *Bact. coli* was strikingly 'clumped'.

Of the seedlings tested in 1949 [ibid., 27, p. 579; 28, p. 305] 1092 a (4) and 1095 b (22) are resistant to blight strains A and C; 1253 a (12), 1256 b (13), 1256 c (7), 1435 (3), and 1439 a (4) to A, B, and C; A 49.1092 b (3) and B 49.1427 a (8) to A and C; D. 49.1488 b (1) to A, B, C, and E; and H 49.1512 c (16) to A, B, E, and F. The seedlings are also, respectively, field immune from [strain] B [of virus X: ibid., 29, p. 274]; A; A and X; B; A, B, and X; A, B, and C [strain of virus X]; A, B, C, and X; B and C; and the last three to X.

The responses of 19 potato varieties and seedlings, reputedly resistant to leaf roll virus and virus Y were compared with 13 standard varieties in a combined trial laid down in 1948 and assessed in 1949. Craigs Alliance, Craigs Royal, Craigs Snow White, 834 c (29), 833 b (98), and 1092 a (4) each received fewer leaf roll infections than their respective control varieties. In addition there were fewer infections with virus Y in Craigs Alliance, Craigs Royal, and 1092 a (4) than in the corresponding controls. Of the continental varieties tested, Flava, Imperia, and an unnamed seedling showed marked resistance to leaf roll, while Imperia, Larch, and three unnamed seedlings were superior to the control varieties in their resistance to virus Y.

In studies of the resistance to virus Y found in *S. rybinii* C.P.C. 979 [cf. ibid., 27, p. 580] no clear-cut segregation ratios were obtained, and it is concluded that the resistance is quantitatively expressed. Some of the hybrids between C.P.C. 979 and parents killed with virus Y were very difficult to infect, and their reactions when infected indicated that the combination of resistance with lethal response offers a very promising source of field immunity from virus Y.

An examination of the reactions of hybrid seedlings derived from *S. brevimucronatum*, *S. jujuyense*, *S. saltense*, *S. simplicifolium*, and *S. rybinii* gave data from which linkage relationships were established between the genes conditioning responses to infection with viruses A and X, and between those conditioning responses to infection with viruses A, C, and Y. In the Nx-Na linkage the crossover value was similar to that already found in commercial tetraploid material, indicating similarity if not identity of the genes concerned.

In replicated field trials, solanaceous hosts affected with certain mild strains of virus X outyielded healthy controls.

In a field plot freshly infected [with *Plasmodiophora brassicae*] the resistant turnip varieties Wallace and Bruce [cf. ibid., 13, p. 343; 15, p. 556; 18, p. 776], acting as controls, had 54 per cent. healthy and 19 per cent. badly diseased plants. Among nine swede strains with 20 per cent. or more healthy plants there was only one Station hybrid, the rest being commercial disease-resistant varieties, mainly samples of Wilhelmsburger or lines selected from them.

Verona (O.). **Comportamento di Agrobacterium tumefaciens in infezioni miste sperimentali.** [The behaviour of *Agrobacterium tumefaciens* in experimental mixed infections.]—Reprinted from *Agricoltura ital.*, 50, (N.S., 6), 2 pp., 1 fig., 1950.

When potted castor oil [*Ricinus communis*] seedlings were experimentally inoculated at the University of Pisa with a pure culture of *Agrobacterium* [*Bacterium*] *tumefaciens* [*R.A.M.*, 26, p. 237] the tumours were larger and grew more rapidly than was the case when mixed cultures of this organism and common soil-inhabiting bacteria were used [cf. ibid., 28, p. 119].

Machacek (J. E.), Russell (R. C.), & Tyner (L. E.). **Treatment of cereal seed.**—*Fmrs' Bull. Canad. Dep. Agric.* 161 (*Publ.* 834), 12 pp., 5 figs., 1950.

After referring to the desirability of cleansing and treating cereal seed to prevent

fungal infection the authors give a brief account of chemical and hot-water treatment and modern seed-treating equipment, followed by notes on the symptoms and causal organisms of the most important seed-borne cereal diseases in Canada [*R.A.M.*, 25, p. 296], viz., wheat bunt (*Tilletia caries* and *T. foetida*) [ibid., 29, pp. 443, 562; 30, p. 291] and loose smut (*Ustilago tritici*) [ibid., 29, p. 457], oat covered and loose smut (*U. kolleri* and *U. avenae*, respectively) [ibid., 29, pp. 206, 255, 411], barley covered smut (*U. hordei*) [ibid., 29, p. 359] false loose smut (*U. nigra*) [loc. cit.], and loose smut (*U. nuda*) [ibid., 29, p. 554]. A table is given classifying the varieties of wheat, oats, and barley as resistant, semi-resistant, and susceptible to these diseases and also according to the type of control suitable, either by chemical treatments or by hot water. Included in the resistant varieties are Renown wheat, resistant to bunt and loose smut, Brighton, Erban, Fortune, and Valor oats, resistant to covered and loose smut, and Titan and Wisconsin 38 barley, resistant to covered and false loose smut. No barley varieties are listed as resistant to loose smut but Compana, Olli, Titan, Warrior, and Wisconsin 38 are semi-resistant.

Leukel (R. W.). **Use of chemicals in cereal seed treatment.**—*Agric. Chemicals*, 5, 8, pp. 27–30, 75, 3 figs., 1950.

The author describes the various types of fungicides used in cereal seed treatments [*R.A.M.*, 29, pp. 90, 94] and gives the rates and methods of applying each fungicide to the crops for which it is recommended.

Peyronel (B.). **Associazione mutualistica fra acari del genere 'Pediculopsis' e taluni funghi parassiti delle piante.** [A mutualistic association between mites of the genus *Pediculopsis* and some fungus parasites of plants.]—Reprinted from *Atti Accad. Torino*, 84, 9 pp., 1950.

In July, 1949, the spikes of several wheat plants at Riclaretto in Val Germanasca were covered and permeated by the mycelium of a *Fusarium* sp. and by abundant fructifications of the *Sporotrichum* type. Whitish or pinkish balls, about 1 to 1·5 mm. in diameter, embedded in the mycelium, were identified as the abdomens of female egg-bearing mites. In the surrounding aerial mycelium there were numerous mature females and a few males. Pure cultures of the fungus and of the mites were readily obtained.

A similar association between *Pediculopsis graminum* and *F. poae* was observed in September, 1949, on abortive and rotting ears of maize around Torre Pellice and in the experimental plot at the Institute of Plant Pathology, Turin University. The mites were shown to disseminate the conidia of the fungus. It seems, therefore, that the *Pediculopsis-Fusarium* association [*R.A.M.*, 6, p. 395] is more common than was hitherto believed.

An association between *Pediculopsis* and *Nigrospora oryzae* [ibid., 26, p. 388] was observed in spring, 1927, in the spikes of several wheat plants damaged by late frosts. The author was able to confirm that as the culture grew older several females crawled towards the mouth of the tube, each carrying two conidia on the abdomen. Observations made in 1949 indicated that *N. oryzae* is widespread in maize fields in the neighbourhood of Torre Pellice and Turin and that it is frequently associated with a *Pediculopsis* similar to *P. graminum*. Cultures of both partners were obtained.

Zacha (V.). **Poznámky k infekci Pšeničných zrn Penicilliem.** [Notes on the infection of Wheat grains with *Penicillium*.]—*Ochr. Rost.*, 23, 2, pp. 165–168, 1950. [English summary.]

In the autumn of 1948 the Institute of Agricultural Phytopathology, Brno, Czechoslovakia, received a wheat grain sample (variety Novodvorská Niva),

originating from Třebíč district from the current harvest, which germinated poorly. It was found that 25 to 30 per cent. of the grains had brownish scutella, pointing to careless handling after threshing. In a test hardly 50 per cent. of the grains germinated and the majority of the ungerminated seed was infected with *Penicillium* sp. [*R.A.M.*, 15, p. 640]. Infection occurs when the fungus penetrates the endosperm (through wounds caused by threshing) under favourable conditions of high temperature and humidity. Seed treatment with ½ per cent. wet germisan for ½ hour increased germination of the infected seed from 49 per cent. (untreated) to approximately 55 per cent.

Adam (D. B.). **Black point and smudge in Wheat.**—*J. Dep. Agric. Aust.*, 54, 2, pp. 76–77, 1950.

During 1948 and 1949 black point or kernel smudge of wheat grains [*R.A.M.*, 17, p. 449; 27, p. 231; 29, p. 15] was widespread in South Australia, probably owing to unusually wet conditions during October in both years. It is, however, of no economic importance. Black point is almost consistently associated with a species of *Alternaria* (*A.* (?) *tenuis*). General discoloration of the ears, due to various causes, was also more common during the two years. In the Roseworthy district a basal glume rot was associated (to a very limited extent) with *Pseudomonas atrofaciens* [ibid., 25, p. 337; 28, p. 511]. A species of *Alternaria*, similar to that associated with kernel smudge, was frequently isolated from discoloured heads [ibid., 22, p. 15], but the occurrence of this type of glume blotch in the field bore no clear relationship to black point. Crops of wheat in which heads affected with *Alternaria* glume blotch occurred produced grain with little or no smudge, while others where smudge was evident at harvest had previously little or no head discoloration.

Russell (R. C.). **A study of the hot water treatment of Barley for the control of loose smut, Ustilago nuda.**—*Sci. Agric.*, 30, 7, pp. 303–315, 2 graphs, 1950.

The hot-water treatment for the control of loose smut (*Ustilago nuda*) of barley [*R.A.M.*, 28, p. 121; 29, pp. 554, 609, 612] was investigated under present-day conditions in the Prairie Provinces of Canada, with a view to reducing the damage caused to the seed to the minimum possible. Tests were conducted on a laboratory scale and on a large scale in tanks. Pre-soaking the seed for up to 25 hours did not in itself depress germination, whereas pre-soaking for 2, 3, 4, 5, 10, and 20 hours followed by hot-water treatment for 11 mins. at 126° F. resulted in 90, 86, 79, 80, 41, and 22 per cent. germination, respectively. Hot-water treatment without pre-soaking reduced germination by only 3 per cent. The average germination of barley seed pre-soaked for five hours and dipped for 11 mins. in water baths at 120°, 126°, 128°, and 130° was 94, 73, 48, and 14 per cent., respectively, and it was delayed in all cases and the seedlings weakened. There were no marked differences in the average percentage germination of seeds given the same pre-soaking and hot-water treatment and then dried at room temperature for 1, 5, 10, 15, and 25 days before sowing, those dried for 5 days in each of four lots germinating slightly better than the others. Threshing (once, thrice, and six times) reduced the percentage germination of untreated grain to 89, 84, 52, and of treated to 28, 21, and 5, respectively. In only one test out of 16 in the greenhouse did pre-soaking for four or five hours followed by treatment at 125° (usually, but sometimes to 128°) fail to give complete control of the disease on five commonly grown varieties with an average infection of 8·5 per cent. Temperatures of 122° also gave complete control, 120° allowed some disease, and 118° was no better than untreated. Pre-soaking infected seed for 2, 3, and 4 hours with treatment for 11 mins. at 126° showed that some seed samples need a longer pre-soak than others. In field tests the average infection and reduction in number of healthy heads of nine samples

after treatment for 11 minutes at 124°, 126°, and 128° (pre-soak 4 or 5 hours) were 0·06 and 14, 0·09 and 25, and 0 and 54 per cent., respectively. In further field tests with shorter pre-soak periods a small amount of smut appeared after pre-soaking for 3 and 4 hours and treating at 127°. Pre-soaking for 5 hours at 70° and treating for 11 mins. at 126° or 127° gave perfect control of the disease but at the higher temperature germination and yield were poorer. The lower temperature is recommended and the seed should be cooled immediately in cold water and spread out to dry. In 1949 when seed was pre-soaked in large scale treatments for 4 hours and then immersed at 126° for 11 mins. in four out of five samples the average reduction in emergence was negligible but smut control unsatisfactory.

In discussing the results the author states that to secure good control of loose smut without undue injury to the seed, each step in the process must receive proper attention. Pre-soaking makes a great difference to the efficiency of the hot-water bath in destroying the fungus and it is necessary to regulate the temperature and time, while the temperature of the hot-water bath should depend on the pre-soak conditions. Reduction in germination ranged from 10 to 30 per cent. in the present investigation when the disease was completely eliminated. Treatment of very badly damaged seed with hot water should be avoided.

Litzenberger (S. C.). **Inheritance of resistance to specific races of crown and stem rust, to Helminthosporium blight, and of certain agronomic characters of Oats.** —*Res. Bull. Ia agric. Exp. Sta.* 370, pp. 453–496, 7 figs., 1949.

Studies carried out at Iowa Agricultural Experiment Station in cooperation with the Bureau of Plant Industry were concerned with the mode of inheritance of resistance in oats to races 1, 6, and 45 of *Puccinia coronata avenae* [*R.A.M.*, 29, pp. 81, 458], races 2, 5, 8, and 10 of *P. graminis avenae*, and *Helminthosporium victoriae* [loc. cit.], using six different crosses [ibid., 28, p. 390]. Races 1 and 6 of *P. coronata avenae* are referred to as race 1, races 2 and 5 of *P. graminis avenae* as race 2, and races 8 and 10 of the latter as race 8 [ibid., 26, p. 385; 29, p. 142], as none of the parental varieties used differentiated between them.

The results showed that segregation for reaction to stem rust in several of the crosses was on a monohybrid basis except in the cross Sac × Hajira-Joanette, where it was on a three-factor basis. A mesothetic type of reaction to race 2 plus race 8 was observed in seedlings classified as susceptible in two crosses, Mindo × Tama and Sac × Hajira-Joanette. As no segregation was observed for reaction to race 2 in either, one factor pair for resistance to race 8 must be allelic to that governing resistance to race 2 possessed by Tama and Hajira × Joanette.

Segregation for reaction to races 1 and 45 of crown rust was on a monogenic, digenic, or trigenic basis in different crosses. Five different factors for resistance to crown rust were identified: A and B, complementary dominant factors giving the Bond type (type 0) of resistance to race 1; L, a simple dominant which gives the Landhafer type (0–1) to races 1 and 45; S, a simple dominant from Sante Fe [ibid., 29, p. 457], which governs resistance (type 0) to races 1 and 45; and V, a simple dominant of the hypersensitive type (type 2) from Victoria which also governs resistance to races 1 and 45.

Susceptibility to *H. victoriae* was inherited as a simple dominant and completely linked with the hypersensitive type of resistance to *P. coronata avenae* possessed by Victoria. The best way of salvaging varieties with Victoria parentage is to replace the V factor by Santa Fe or Landhafer factors. Genetic evidence indicates that resistance or susceptiblity to these two diseases depends on the same factor pair. This relationship also suggests the inadvisability of utilizing the hypersensitive type of resistance to *P. coronata avenae* of Victoria in attempting to obtain resistance to race 45. Agreement between seedling and mature plant reaction was generally good.

Tessi (J. L.). **Presencia de 'Pseudomonas coronafaciens' en la Argentina y reacción de algunas variedades de Avena frente a este parásito.** [Presence of *Pseudomonas coronafaciens* in Argentina and reaction of some Oat varieties towards this parasite.]—*Rev. Invest. agríc., B. Aires*, 3, 4, pp. 319–334, 4 pl., 1949.

This is a full, tabulated account of the author's studies on *Pseudomonas coronafaciens*, the agent of halo blight of oats, the recent discovery of which in Argentina has already been reported from another source [*R.A.M.*, 29, p. 353]. Judging by the reactions of 15 varieties to inoculation with 13 collections of diverse origin, the indigenous population of the bacterium may be regarded as homogeneous for the practical purpose of varietal selection.

Ivanov (X.). **Ustilagineous pneumonia in cattle. The spores of Ustilago maydis as a pathogenic factor.**—*C.R. Acad. bulg. Sci.*, 2, 2–3, pp. 49–52, 3 figs., 1949.

Particulars are given of a severe outbreak of broncho-pneumonia and vascular emphysema among cattle in north-western Bulgaria following the maize harvest of 1946. The drought of the preceding summer having destroyed all the other local cereal and forage crops, the animals had been fed on maize which was subsequently found to be infected by smut (*Ustilago maydis*) [*R.A.M.*, 29, p. 361] and is believed to have been the cause of the disease.

Marchionatto (J. B.). **Identificación de la lepra explosiva del Naranjo con la leprosis de los Citrus.** [Identification of 'lepra explosiva' of the Orange with leprosis of Citrus.]—*Cienc. e Invest.*, 6, 7, pp. 331–333, 2 figs., 1950.

An account is given of the history of 'lepra explosiva' of orange and of the studies in Argentina demonstrating its etiological connexion with the toxins secreted by the acarid *Brevipalpus* (*Tenuipalpus*) *cuneatus* [*R.A.M.*, 24, p. 446]. Recent investigations in the United States (abs. in *Phytopathology*, 40, pp. 7, 15) have provided further evidence of the association between the acarid and 'lepra explosiva', and also of the identity of the Argentine disease with 'scaly bark [leprosis] in Florida [*R.A.M.*, 23, p. 61; 24, p. 366, *et passim*].

Haas (A. R. C.). **Acorn disease in Grapefruit.**—*Calif. Citrogr.*, 35, 11, p. 457, 1 fig., 1950.

Stubborn or 'acorn' disease [*R.A.M.*, 26, p. 12] has recently been found in a 15-year-old orchard of Marsh grapefruit on sweet orange stock in the Colton area, San Bernardino county. Although affected the yield and size of the fruit were excellent. Both healthy and 'acorn' fruits occurred on one tree. No 'pink nose' or 'blue albedo' was found on the affected fruits, and the trees bearing 'acorn' fruit appeared normal, though the leaves were relatively shorter and broader than healthy ones.

Marsh (P. B.), Guthrie (L. R.), Bollenbacher (Katharina), & Harrell (D. C.). **Observations on microbiological deterioration of Cotton fiber during the period of boll opening in 1949.**—*Plant Dis. Reptr*, 34, 6, pp. 165–175, 3 figs., 1950. [Multilithed.]

Fungus attack caused serious reduction in the yield and quality of cotton fibre during boll opening in 1949 in the vicinity of Florence, South Carolina. The trouble was largely due to a species of *Diplodia* and to *Glomerella gossypii*, both of which were associated with a symptom complex designated 'fungus tight lock'. The locks failed to fluff either completely or partially, they were more or less discoloured and the fibres weakened; the boll, however, was not distorted and the lock was not bound to the carpel wall by mycelium. Typical *Diplodia* boll rot was also prevalent [*D. gossypina*: *R.A.M.*, 10, p. 240, 21, p. 14, *et passim*]. The probable

importance of anthracnose (*G. gossypii*) tight locks as a source of inoculum for seedling infection is noted. The chief factor affecting the incidence of fungus tight lock appears to be the density of the leaf cover round the bolls. Chemical defoliation gave major decreases in the percentage of bolls with *Diplodia* boll rot and 'fungus tight lock'.

Smith (A. L.). **Ascochyta seedling blight of Cotton in Alabama in 1950.** —*Plant Dis. Reptr*, 34, 8, pp. 233–235, 1950. [Multilithed.]

Losses of cotton seedlings and young plants in the 6- or 8-leaf stages caused by *Ascochyta gossypii* [*R.A.M.*, 5, p. 599; 20, p. 14] were sporadic or locally epidemic from 1947 to 1949 in Alabama, but became general in the northern third of the State in 1950; they were particularly severe in the north-east. In De Kalb county many stands were reduced to between 50 and 70 per cent. Frequent local showers and prolonged cool weather in this area were responsible for the epidemic. The loss of plants and disease intensity varied widely from field to field, depending upon the cultural practices followed and the preceding crop. Very light infections occurred when cotton followed other crops (mostly maize), and were most severe after cotton, the plant debris from the previous crop constituting the major source of inoculum.

Evidence obtained indicated that the disease is seed-borne. Seedlings from untreated seed grown in fields following maize developed 100 per cent. infection on the cotyledons. Seed treatment resulted in much lower infection percentages in other rotated fields. In all cases sufficient leaf spots occurred to reinfest all plantings, and, consequently, planting cotton after other crops would be of definite control value for the current season only. But seed-borne inoculum alone is not an important factor in reducing seedling stands, as the time required for the development of the disease on cotyledons is too long for secondary infection of higher leaves. Seedling losses resulted only from infections originating largely from soil-borne inoculum.

All 25 cotton varieties tested proved susceptible in the seedling stage. Empire, which has mature plant resistance appeared somewhat less susceptible in the seedling stage than the other varieties. Late-planted fields were usually less severely infected (with no loss of stand) than early planted ones. Crop rotation [ibid., 2, p. 216; 27, p. 565] is recommended as the most effective control measure. Immediate ploughing under of cotton stalks after harvest, autumn disking, deep spring ploughing or flat planting give partial control.

The author suggests 'wet-weather blight' as a common name for the disease.

Ferreira (J. D.). **Um fungo parasita da 'Cydia pomonella' L.** [A parasitic fungus on *Cydia pomonella* L.]—*Rev. agron., Lisboa*, 31, 2, pp. 85–117, 7 pl., 3 graphs, 1943. [Received 1950.]

A full account is given of the writer's studies on a fungus parasitizing codling moth (*Cydia pomonella*) larvae at Chamusca, Portugal. The most favourable of the culture media tested for conidial production were Dox, potato dextrose, and chestnut agar. The minimum, optimum, and maximum temperatures for the growth of the fungus are 5°, 23° to 27°, and 35° C. The white, felt-like mycelium, becoming farinose in a few days, consists of hyaline, septate, frequently anastomosing hyphae, 2·5 to 3 μ in diameter. The hyaline, continuous, globose or elliptical conidia are commonly formed sympodially at the tips of phialides, as in the genus *Beauveria*. They may, however, develop in small, apical clusters. The more abundant globose conidia measure 2 to 4 (mean 3) μ in diameter and the elliptical 4·2 by 3 μ. Chlamydospores averaging 10 μ in diameter were formed in one-month-old Van Tieghem cell cultures; no reference to these spores could be found in

the relevant literature. The species under observation presents analogies with *B. bassiana* [*R.A.M.*, 29, p. 89], but differs from it in temperature relations [ibid., 6, p. 610] and conidial dimensions and does not appear to have been previously described.

In agreement with Toumanoff [ibid., 13, p. 575] and contrary to the findings of Baldacci (*Atti Ist. bot. Univ. Pavia*, Ser. IVa, 11, pp. 153–189, 4 graphs, 1939), the author detected no loss of virulence in the conidia of *B. bassiana* in culture. Once contact is established with the cuticle of the larva, the conidia are infective even in a very dry atmosphere (40 per cent. relative humidity). The proliferation of the mycelium in the blood is the principal cause of death. Judging by the positive results of inoculation experiments on *Limantria dispar*, *Sitotroga cerealella*, *Galerucella lutealla*, *Bombyx mori*, *Leptinotarsa decemlineata*, and *Phthorimaea operculella*, the *Beauveria* attacking *C. pomonella* is highly polyphagous, and the possibilities of its practical utilization are briefly discussed.

Korringa (P.). **Investigations on shell-disease in the Oyster, Ostrea edulis L.**— The International Council for the Exploration of the Sea. Special Scientific Meeting on Shellfish, October 1949. 7 pp. [? 1949. Mimeographed.]

Researches on the destructive shell disease of oysters [due to an unidentified Phycomycete: *R.A.M.*, 29, p. 509], which has been prevalent at the Oosterschelde oyster centre, Holland, for many years, have been carried out by the author since 1937 at the Bergen-op-Zoom Shellfish Laboratory and in the breeding-grounds.

The first visible symptoms, appearing a few days after infection, are pin-head white specks in the substance of the shell, and are present in oysters of all ages. Each speck has a small hole in the centre, traversed by a fungus thread. The specks increase to cloud-like, chalky white spots on the inner surface of the shell and ultimately to green or orange-brown, rubber-like spots and warts, apparently due to an abnormally intense secretion of conchyolin. Severe infections are accompanied by deformations of the shell edge and hinge and result in heavy mortality especially of young oysters.

Oyster spat are very susceptible and heavy attacks may cause death within a few months. One-year-old oysters die if severely attacked. Healthy oysters two years old or more appeared to be resistant. Only thin and exposed shells can be attacked. When pieces of shell bearing white specks were implanted in the shells of healthy oysters new growth from these areas was diseased, while the rest of the shell remained healthy.

Examination of a great number of samples from various Dutch beds showed that shell disease is not evenly distributed. Marked niduses with high disease incidence were located, which gradually blended into healthy areas. Intensity varied from year to year but infection centres appeared to be fixed. High percentages of old shells (mostly *Cardium edule*) scattered as collectors, bearing perforating algae and abundant fungus hyphae, were found in the superficial bottom layers of each nidus; these proved to be the sources of infection, as spat found on the shells were invariably severely diseased. Apparently the fungus easily perforates the thin ventral shell of the newly settled spat when on infested material but not when on healthy. Experiments and observations demonstrated that shell disease spreads only in the summer (end of May to 1st October), at water temperatures exceeding 19° C., when the fungus produces abundant spores, which are carried about by water currents. A temperature of 19° or more must be maintained for about ten days before shell-disease makes its appearance.

Control consists in the wholesale cleaning of old beds, prohibition of the scattering of cockle shells in the beds, and soaking oysters showing early symptoms for one hour in a toxic solution of an organic salt of mercury. This method saved about 15,000,000 one-year-old oysters in the warm summer of 1947.

Rüdiger (W.). **Untersuchungen über die Pustelkrankheit des Leins (Phoma lini).** [Researches on the pustule disease of Flax (*Phoma lini*)].—*Beitr. Agrarwiss.*, 2, pp. 56–60, 1948. [Abs. in *Biol. Abstr.*, 24, 7, p. 2034, 1950.]

For several years a new disease characterized by browning and drying of the leaves and breaking of the stems at the base has affected flax in Germany. The causal fungus is tentatively identified as *Phoma lini* [*R.A.M.*, 18, p. 315]. Mass infection was obtained most rapidly by inoculating the plants with small pieces of agar cultures after scraping off the wax film. It is presumed that infection by this fungus, as with *Polyspora* [*lini*], is possible only if the plant is first injured by nymphs of *Thrips lini*. Experiments indicated that seedlings may contract infection from the soil. Under apparently uniform conditions some plants among infected ones remained healthy.

Blattný (C.), Osvald (C. V.), & Novák (J.). **Virosy a z viros podezřelé zjevy u Konopí (Cannabis sativa).** [Viroses and suspected virus diseases of Hemp (*Cannabis sativa*).]—*Ochr. Rost.*, 23, 1, pp. 5–9, 1 pl., 1 fig., 1950. [Russian and French summaries.]

Although the authors found no descriptions of hemp virus diseases in the literature [but see *R.A.M.*, 22, p. 23; 24, p. 372], their examination of hemp plants at the State Flax Experiment Institute at Temenice, near Šumperk, Czechoslovakia, and their further work indicate that such diseases are common. In some cases virus nature has not yet been proved, but is very probable. The symptoms include discolorations, various mosaics, and leaf deformations, e.g., enations occur frequently in glasshouse plants and are transmitted by seed. As in hops [ibid., 30, p. 78] the viruses sometimes form complexes. It is suggested that healthy young hemp plants might be used as indicators for hops viruses.

Verneau (R.). **Contributo alla conoscenza delle malattie di piante ornamentali.** [Contribution to the knowledge of the diseases of ornamental plants.]—*Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), 11, pp. 1–18, 2 pl., 2 figs., 1949. [Received July, 1950.]

In these notes on diseases of ornamentals grown commercially in southern Italy, it is stated that gladiolus corms from other parts of Italy and Holland show about 15 to 25 per cent. dry rot due to *Fusarium oxysporum* var. [f.] *gladioli* [*R.A.M.*, 29, p. 261]. Control is attained by digging the corms when dry, careful storage, rotation, treatment with ceresan [ibid., 29, pp. 363, 466], and soil disinfection. The varieties Nuova Europa and (especially) Kassel are resistant. Corms from Holland and those reproduced locally from Dutch material also develop rot due to *Penicillium gladioli* [ibid., 13, p. 518; 28, p. 455; 29, p. 261]. Control is recommended by the usual methods of field and storehouse sanitation [ibid., 20, p. 364] and rotation.

Gardenia canker (*Phomopsis gardeniae*) [ibid., 19, p. 413; 20, p. 120] occurred on young potted plants in glasshouses at Naples, Portici, and Torre del Greco. All unnecessary wounding should be avoided and pruning cuts should be disinfected with acid ferrous sulphate and protected with lute. All infected branches should be cut away together with the yellowish parts and destroyed. Plants with stem lesions should be destroyed. In winter the stems and branches should be brushed over with 3 to 4 per cent. Bordeaux mixture and in spring sprayed with 1·5 per cent.

Baker (K. F.). **Plant diseases as a factor in California cut flower production.**—*Flor. Rev.*, 106, 2737, pp. 31–32, 67–72, 1950.

After discussing the growing competitive nature of floriculture in California [*R.A.M.*, 28, p. 16], the author deals with disease problems for which there is a

measure of control, but not yet practised in California, and with the kind of changes necessary to make these measures effective. The use of disease-free *Chrysanthemum* cuttings grown by an eastern propagator would eliminate growth irregularities caused by *Chrysanthemum* stunt virus [ibid., 29, pp. 27, 198] and *Deuterophoma* [ibid., 28, p. 334] and reduce losses from *Verticillium* wilt [*V. dahliae*: ibid., 20, p. 118; 27, p. 136]. The intensive culture methods used in the east, whereby flowers are raised in small steamed or treated beds, could profitably be applied in California.

In the greenhouses at the University of California decorative plants have been freed from leaf-invading bacteria or nematodes simply by avoiding wetting the leaves. New growth then develops clean and provides healthy cuttings. The author suggests that stock mosaic virus [ibid., 27, p. 567; 28, p. 291] could be controlled by growing stocks [*Matthiola incana*] in insect-proof cloth houses. Growers should make sure that they sow only seed treated against bacterial blight [*Xanthomonas incanae*: ibid., 22, p. 25].

Infection of a field of China asters by *Fusarium* wilt [*F. conglutinans* var. *callistephi*: ibid., 27, p. 576; 29, pp. 289; 30, p. 42] can be prevented by treating all seed beds chemically or with steam and disinfecting seeds with mercuric chloride. Really resistant lines of asters could be supplied by seedsmen and the author states that a positive, quick method for the elimination of susceptible plants in the seedling stage has been developed. Resistant lines which were supplied to seed companies were not utilized and the strains were lost. The paper concludes with a plea for unified action by growers, seedsmen, propagators, farm advisers, and experiment station workers.

Camellia research.—75 pp., 5 figs., Pasadena, The Southern California Camellia Society, 1950. $1.25.

In a paper on virus transmission through grafting (pp. 68–71) E. C. Tourje states that a series of experiments were conducted in February, 1949, by the Horticultural Research Committee (instituted by the California Institute of Technology), to determine whether the *Camellia* virus (Milbrath, J. A. & McWhorter, F. R.—Yellow mottle leaf; a virus disease of Camellia.—*Amer. Camellia Yearb.*, pp. 51–53, 1946) could be transmitted by grafting to healthy plants. The C. M. Hovey variety, which has never shown leaf mosaic, mottling, or petal variegation, was used as stock, to which scions of suspected plants were grafted by inarching and cleft grafts, and scions from C. M. Hovey were grafted to the suspected varieties.

Observations in 1950 appear to justify the tentative conclusion that many of the suspected varieties do not harbour viruses, and the symptoms are evidence of a genetic condition only. However, the strain or type of virus present in the variety Chandleri Elegans was transmitted in all the experiments and the variegation observed in this variety is therefore considered to be of virus origin. Further work is in progress.

D. G. Milbrath states in his study on camellia flower rot control (pp. 72–73) that fermate sprays [*R.A.M.*, 25, p. 561] against the causal organism *Sclerotinia camelliae* [see next abstracts] at 1 lb. per 100 gals. water should be applied to the surface of the ground at intervals of 14 days, with additional applications during or after rainfall. It may take more than one season to eradicate the fungus.

Watson (Alice J.). **Fungi associated with Camellia flowers.**—*Plant Dis. Reptr*, 34, 6, pp. 186–187, 1950. [Multilithed.]

A briefly annotated list is given of 32 species of fungi isolated from 150 collections of *Camellia* flowers with the appearance of blight from Alabama, Florida, Georgia, Louisiana, Mississippi, and North and South Carolina. *Sclerotinia camelliae*

[*R.A.M.*, 27, p. 440; 29, p. 414, and preceding and next abstracts] was obtained once from Winnabow, North Carolina, and once from Atlanta, Georgia.

Plakidas (A. G.). **Camellia flower blight in Louisiana.**—*Plant Dis. Reptr*, 34, 6, p. 188, 1950. [Multilithed.]

One collection of *Camellia* flowers on exhibition at Shreveport, Louisiana, was found, on 26th February, 1950, to be infected by *Sclerotinia camelliae* [see preceding abstracts]. They had been imported from California, in violation of the State quarantine. All the camellias on show were burnt. On 3rd April the fungus was identified on two separate flowers from potted plants in a lath house in a private garden at Shreveport. The owner stated that he had purchased container-grown plants from California for several years, either directly or through the nurseryman on whose exhibit the disease was found. Some of the *Camellia* flowers in the lath house had shown similar symptoms the year before. Three additional specimens of fallen flowers bearing sclerotia typical of *S. camelliae* were found subsequently, one in the nursery of the exhibitor referred to and two in private gardens. Caddo Parish, in which Shreveport is situated, has been placed under quarantine and a concerted effort is to be made to eradicate the disease.

Baker (K. F.) & Davis (Lily H.). **Stemphylium leaf spot of China Aster.**—*Mycologia*, 42, 4, pp. 477–486, 2 figs., 1950.

In August, 1946, commercial cut-flower plantings of China asters near Redondo Beach, California, suffered serious localized losses from a spotting of the leaves, bracts, and, occasionally, petals and stems [*R.A.M.*, 27, p. 567]. The young leaf spots were brown and almost circular; as they enlarged the area surrounding the original spot became pale though the advancing margin remained dark, the spots thus assuming a concentrically zonate appearance. The lesions measured 1 to 10 mm. in diameter and sometimes coalesced into irregular areas which in some instances became so large that they killed the leaf. In moist conditions the centres bore dark spore masses, particularly on the under surface. The dead centres sometimes cracked and fell out. In some cases severely affected plants had so many dead leaves as to obscure the fact that leaf spot was present. The cut flowers were unsaleable and specimens not visibly infected frequently decayed in transport.

The condition was constantly associated with a *Stemphylium* with brown, septate, usually unbranched, conidiophores measuring 37 to 134 by 6 to 11 (average 71 by 8) μ, borne singly or rarely in fascicles of two to three. The bases were slightly swollen and the distal ends bulbous. The brown, muriform conidia were borne singly, had relatively smooth walls, were oblong to obclavate, and had a subacute to conical distal end. There were three to ten (commonly five to six) cross septa, the two major ones being generally deeply constricted. Longitudinal septa varied in number with spore age. The conidia mostly measured 26 to 67 by 15 to 30 (average 47 by 23) μ, but attained a length of 72 μ in moist conditions; in culture they were generally longer and narrower than on the host.

The fungus grew well on potato dextrose agar, and at room temperature. A mat of hyaline, wavy mycelium was formed, and dark green aerial hyphae with masses of dark spores later developed in the centre. The under side was almost black. The fungus is named *S. callistephi* n.sp.

When healthy China aster plants in the greenhouse were sprayed with a suspension of spores from pure cultures and kept in conditions of high humidity for two days, typical leaf spot began to appear five days after inoculation. Parasitic relations with the host were not established unless the sprayed plants were kept moist for 48 hours. When aster seed was surface sterilized, dried, dipped in a spore suspension, and again dried, and then planted in sterile black peat, the conidia

caught in the seed bristles germinated and mycelium grew on the testa, sporulating copiously as the seedlings emerged. Infections develop on the hypocotyl as chestnut brown streaks and pin-point lesions. The cotyledons are frequently infected and develop numerous spots, or decay and kill the growing-point; conspicuous sporulation then occurs. Planting in low, protected situations should be avoided and ditch irrigation rather than overhead practised.

The disease appeared in March, 1950 in San Mateo and San Clara counties in commercial fields and in cloth houses under conditions of excessive irrigation.

BAKER (K. F.) & MACLEAN (N. A.). **Powdery mildew of Snapdragon on the Pacific coast.**—*Plant Dis. Reptr*, 34, 6, pp. 183–185, 1950. [Multilithed.]

Snapdragon (*Antirrhinum majus*) powdery mildew (*Oidium* sp.) [cf. *R.A.M.*, 16, p. 277; 27, p. 78], not hitherto reported from the western United States, was noted at Pullman, Washington, in 1948, and in three greenhouses in the Redwood City area of San Mateo County, California, in 1949. The conidiophores of the United States material and specimens from England resembled those of *Erysiphe cichoracearum*.

JEHLE (R. A.) & JENKINS (ANNA E.). **Supplementary survey for spot anthracnose of flowering Dogwood in Maryland and Virginia.**—*Plant Dis. Reptr*, 34, 8, pp. 225–226, 1 fig., 1950. [Multilithed.]

The 1949–50 survey for spot anthracnose (*Elsinoe corni*) [*R.A.M.*, 27, p. 476] of flowering dogwood (*Cornus florida*) demonstrated that the lesions of the fungus appear on the new season's growth. The most northerly record for the disease in Maryland is in the vicinity of Rockville, Montgomery County. On a residential property of Snow Hill, young trees sprayed early in the season with Bordeaux mixture and later with equal parts of fermate and dentate became only moderately infected, while the foliage of an old unsprayed tree was severely diseased.

In a note on p. 227 G. H. HEPTING states that leaf infection was severe in the Appalachians, Virginia, in 1950.

DESHMUKH (N. Y.) & MAHMUD (K. A.). **A root-rot disease of Ocimum sanctum Linn.**—*Mag. agric. Coll. Nagpur*, 25, 1–2, pp. 3–4, 1950.

During August, 1947, a root disease of *Ocimum sanctum*, causing wilting and withering of the aerial parts of affected plants, blackening of the stem at or just below ground level, and rotting of the main root system, occurred at Nagpur. The causal organism was identified as *Rhizoctonia bataticola* [*Macrophomina phaseoli*], believed to be the first record of this fungus on *Ocimum* spp.

TOMPKINS (C. M.) & TUCKER (C. M.). **Rhizome rot of White Calla caused by Phytophthora erythroseptica.**—*Phytopathology*, 40, 8, pp. 712–714, 1 fig., 1950.

A rhizome rot of the widely grown white calla (*Zantedeschia aethiopica*) caused by *Phytophthora erythroseptica* [*R.A.M.*, 26, p. 547] is prevalent in the San Francisco Bay region of California. External symptoms of the disease consist of irregular, dark brown, watersoaked lesions of varying size, becoming desiccated and slightly sunken with age. Internally the infected tissues appear light grey and firm, but of a rubbery texture and separated from the sound portion by a definite line of demarcation. Each rhizome may contain one or more infection foci. An isolate of the fungus was pathogenic to healthy rhizomes of *Z. aethiopica* in greenhouse tests, the incubation period being about ten days. In pot inoculation experiments the foliage, roots, and rhizomes of actively growing, healthy plants were not attacked. Like the pink calla (*Z. rehmannii*) isolates [loc. cit.], those from *Z. aethiopica* proved innocuous to potato, but the morphological and physiological similarity between

the material from the different hosts is regarded as convincing evidence of identity. This is apparently the first record of *P. erythroseptica* as a parasite of *Z. aethiopica*.

De Tempe (J.). **De Phialea-ziekte van Raaigras in Nederland.** [The *Phialea* disease of Rye Grass in the Netherlands.]—*Tijdschr. PlZiekt.*, 56, 2, pp. 164–169, 1950. [English summary.]

At the Wageningen (Holland) Seed Testing Station in 1949, out of 14 poorly germinating samples of 50 seeds each of rye grass examined by the droplet method [*R.A.M.*, 27, p. 185], one (Westerwolds) [*Lolium westerwoldicum*] yielded 44 per cent. *Phialea temulenta* [ibid., 29, p. 156], one 34 per cent., one 10 per cent. (both English) [*L. perenne*], one 4 per cent. (*L. westerwoldicum*), and three (two *L. perenne* and one Italian [*L. multiflorum*]) 2 per cent. Of five 1948 samples of normal germinability (90 per cent. and upwards) only one (*L. perenne*) contained 2 per cent. infected seeds. Of nearly 500 samples received in 1949, 25 were of low germinative capacity (80 per cent. or less); one of these harboured 66 per cent. *P. temulenta*, one 33 per cent., probably mixed with *Pullularia pullulans* [ibid., 19, p. 23] (both *L. perenne*), one 8 per cent. (*L. perenne*), one 6 per cent. (*L. westerwoldicum*), and four 2 per cent. (two *L. perenne* and two *L. westerwoldicum*). The most heavily contaminated sample yielded an isolate with spores of exactly the same length (13·1 μ) as those developing in Irish material. The examination of a further 21 samples of *L. perenne* of normal or unknown germinability disclosed 14 per cent. *Phialea temulenta* in one and 2 per cent. in two. Since most of the poorly or non-germinating samples were practically free from the blind seed fungus, while conversely, many infected seeds gave rise to normal plants, *P. temulenta* would appear to be of little importance in Holland as a factor in the low germinability of rye grass.

Tiffany (Lois H.). **Further observations on Claviceps purpurea.**—*Proc. Iowa Acad. Sci.*, 55, pp. 217–221, 1948. [Received December, 1950.]

In further work on sclerotial germination in *Claviceps purpurea* (*Proc. Iowa Acad. Sci.*, 53, pp. 189–190, 1946) at the Iowa Agricultural Experiment Station [see also *R.A.M.*, 29, pp. 83, 360, 567], sclerotia from 41 species of Iowa grasses were used. Good germination was obtained from two-year-old sclerotia from rye, *Bromus inermis*, *Dactylis glomerata*, and *B. marginatus*, and from three-year-old sclerotia from *B. inermis*, all of which had been kept in envelopes in a drawer. The sclerotia varied greatly in size; the smallest, from *Poa pratensis*, measured 2 mm. in length while the largest, from rye, were 2·3 cm. long. Sclerotial size appeared to be related to the size of the normal grain of the infected plant, and it also influenced the size and number of the stromata which developed. The asci were hyaline, thread-like, and often slightly curved. Ascospore lengths differed among the various host collections. All were somewhat larger than the range of 50 to 76 μ given by Saccardo as characteristic of *C. purpurea*. Young ascospores were always continuous and contained minute oil droplets. Slightly more mature spores were tri-septate, the end cells being much longer than the central ones, and fully mature ones had up to twenty septa. Ascospores from sclerotia from *B. purgans*, however, remained continuous throughout their development. Mature ascospores from all sclerotial collections formed germ-tubes readily in water or water agar after a few hours.

Kreitlow (K. W.), Sherwin (Helen), & Lefebvre (C. L.). **Susceptibility of tall and meadow Fescues to Helminthosporium infection.**—*Plant Dis. Reptr*, 34, 6, pp. 189–190, 1950. [Multilithed.]

An experiment at Beltsville, Maryland, indicated that the Alta and K31 strains of tall fescue (*Festuca elatior* var. *arundinacea*) were susceptible by inoculation to

an isolate of *Helminthosporium dictyoides* [*R.A.M.*, 26, p. 493] from Georgia and to three cultures of *H. sativum* [ibid., 3, p. 28; 19, pp. 258, 601] from Virginia and Maryland. In another experiment, at State College, Pennsylvania, the strains N.Y. 2659, Alta, and K31 were all susceptible to *H. dictyoides*. Differences in the reaction among plants of *F. elatior* and *F. elatior* var. *arundinacea* to *H. dictyoides* in both field and greenhouse suggest that it may prove possible to isolate resistant plants.

Evans (H. J.). **The importance of molybdenum in fertilizer.**—*Agric. Chemicals*, 5, 8, pp. 31–32, 72–75, 1950.

After reviewing from 59 contributions to the literature the importance of molybdenum to plant growth [*R.A.M.*, 29, p. 54], the author describes experiments to determine the molybdenum status of lucerne [cf. ibid., 25, p. 562] in New Jersey. They demonstrated the importance of this element in nitrate metabolism and showed that it is essential for nitrogen fixation by the crop and highly beneficial for the utilization of nitrates. Field experiments with lucerne showed that not more than ½ lb. molybdenum trioxide per acre should be applied to soils with a pH value of 6 or below, or ¼ lb. for those above pH 6. Analyses showed that the small amounts of soluble molybdenum normally present in lime, potassium, and nitrogen fertilizers would not meet the requirements of legumes.

Ramsfell (T.). **Et middel mot frukttrekreft.** [A remedy for fruit tree canker.]—Reprinted from *Gartneryrket*, *1950*, 3, 1 p., 1 fig., 1950.

Very effective control of fruit tree canker (*Nectria galligena*) has been obtained of recent years in Norway [*R.A.M.*, 17, p. 467] by painting the wounds (previously freed from loose bark with a steel brush) with a thick fluid known as 'kankerdood', supplied by J. L. H. Smits & Co., Amsterdam. The preparation contains mercury and copper compounds, iron and zinc oxides, and substances exerting a stimulatory action on wound cork formation [ibid., 29, p. 262]. The treatment appears actually to destroy the fungus and not merely to inhibit its growth.

Garcés (C. O.). **La diseminación de los fitopatógenos.** [The dissemination of plant pathogens.]—*Rev. Fac. Agron. Medellín*, 11, 37, pp. 1–18, 1950.

Information on the methods and agents of dissemination of plant pathogens is summarized and discussed in the light of some important contributions to the literature on the subject.

Weiss (F.). **Index of plant diseases in the United States. Part I Acanthaceae–Compositae. Part II Convolvulaceae–Gnetaceae.**—*Spec. Publ. Plant Dis. Surv.* 1, part I, pp. 1–218, 2 maps; part II, pp. 219–381, 1950.

This index [cf. *R.A.M.*, 5, p. 568] has been compiled primarily from the indexes of the Plant Disease Survey, which consist first of reports from collaborators and other pathologists, and secondly from references to literature on plant disease occurrence in the United States. The information has been identified, verified, and brought up to date and should meet the need of pathologists and quarantine officials for a comprehensive, integral list of the agents of disease and deterioration of plants and plant products in the whole of the United States. The number of host genera has increased, compared with the previous list [loc. cit.], from 285 to 1,216 and organisms and non-parasitic diseases from 4,200 to 50,000. Part I contains the lists of plant diseases occurring in 43 families from Acanthaceae to Compositae, and Part II deals with 31 families from Convolvulaceae to Gnetaceae. The index is essentially an annotated host list, the members of each family being listed alphabetically under the Latin binomial, together with the common names and distribution. Under each is given a list of pathogens, followed by the common names of the diseases and their distribution.